

TECHNICAL DRAINAGE STUDY

for

Golden Valley Ranch
Mohave County, AZ
Area 2, Phases A & B

Prepared for:

Rhodes Homes Arizona, LLC.

2215 Hualapai Mountain Rd., Suite H

Kingman, Arizona 86401



Stanley Consultants INC

A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

Technical Drainage Study

For

**Area 2, Phases A & B
Golden Valley Ranch
Mohave County, AZ**

**March 2006
SCI Project # 18449.00.00**

Prepared for:

**Rhodes Homes Arizona, LLC.
2215 Hualapai Mountain Road, Suite H
Kingman, Arizona 86401**

Prepared By:

**STANLEY CONSULTANTS, INC.
5820 South Eastern Avenue, Suite 200
Las Vegas, Nevada 89119
(702)369-9396
Fax (702)369-9793**



GOLDEN VALLEY RANCH

TABLE OF CONTENTS

1.	GENERAL LOCATION AND DEVELOPMENT DESCRIPTION	1
1.1.	Introduction	1
1.2.	Location.....	1
1.3.	FEMA Flood Hazard Zone.....	1
2.	SITE DESCRIPTION.....	1
2.1.	Description of Property	1
2.2.	Drainage Descriptions	4
3.	METHODS AND CRITERIA	4
3.1.	Methodology	4
3.2.	Drainage Shed and Modeling Convention	6
3.3.	Design Storm and Precipitation.....	6
3.4.	Soils.....	7
3.5.	Model Data and Results	7
4.	Drainage Improvements within the Public Right-of-Way	9
5.	Comparison of Flows	9
6.	FEMA Base Flood Elevations	12
7.	SUMMARY	12
8.	REFERENCES.....	12

GOLDEN VALLEY RANCH

LIST OF TABLES

Table 1 - Precipitation 7

Table 5 –Flow Summary 8

Table 3 – Flow Comparison 9

LIST OF FIGURES

Figure 1 – Vicinity Map and Regional Drainage Scheme 2

Figure 2 - Flood Insurance Rate Map, Mohave County, Arizona..... 3

Figure 3 – Area 2 Drainage Shed Map..... 5

Figure 4 – Drainage Improvements within Public Right-of-Way 10

Figure 5 – Existing Runoff - Flow Comparison 11

Figure 6 – Base Flood Elevation (BFE)..... 13

GOLDEN VALLEY RANCH

APPENDICES

Appendix A Area 2 – Results and Data

- HEC-HMS 100-yr, 6-hr Simulation
- HEC-HMS 10-yr, 6-hr Simulation
- NOAA Atlas 14 – Precipitation
- STANDARD FORM 4 – Time of Concentration

Appendix B Drainage Infrastructure Calculations

- COMMON LOT O (P1-83)
- COMMON LOT F (J-C14)
- COMMON LOT E (J-C17)
- H STREET (J-C21)
- COMMON LOT D (J-C25)

Appendix C Street Capacity (Local Streets)

Appendix D Public Right-of-Way Drainage Improvements

- INLET CALCULATIONS
- HYDRAULIC CALCULATIONS – WEST LOOP ROAD
- CULVERT CAPACITY (J-C26, J-N5, J-N25, J-H, & J-N2)

**Appendix F Plans - Not Included with this Study
(See Grading Plans this Project)**

GOLDEN VALLEY RANCH

1. GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

1.1. Introduction

This study is submitted as the technical drainage study for the proposed improvement plans of Area 2, Phases A & B of the Golden Valley Ranch residential development located in the Sacramento Valley of Mohave County, Arizona, more specifically on the south side of the Golden Valley Community, near Kingman. Area 2 comprises of approximately 205 acres of the total 5,800 acres of land located in the Golden Valley Ranch.

The purpose of this study is to accompany the storm drainage infrastructure of the proposed development for Area 2, Phase A only. Phase B improvements will be submitted at a later date. Documentation for Phase B is included to provide continuity in the infrastructure improvements.

This study is divided into four separate areas of consideration. They are as follows:

- A general overview of site drainage
- A detailed analysis of the proposed storm drainage infrastructure.
- An analysis of the drainage improvements in the Public Right-of-Way.
- An evaluation of interim facilities serving the site

1.2. Location

The Golden Valley Ranch project site consists of Taxpin Numbers 215-01-048, 215-01-075, 215-01-078, 215-01-079, 215-01-080, 215-01-084, 215-01-085, 215-01-092, & 215-15-005 within Township 20 North, Range 18 West and Township 21 North, and Range 18 West, G&SRM, Mohave County, Arizona (Figure 1 - Vicinity Map and Regional Drainage Scheme).

1.3. FEMA Flood Hazard Zone

Figure 2 is a representation of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Mohave County, AZ, map number 040058 2325C, dated October 20, 2000. Of the 205 acres of Area 1, 42 acres lies in Special Flood Hazard Zone A.

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFE's) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

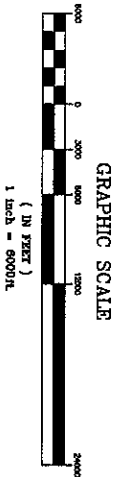
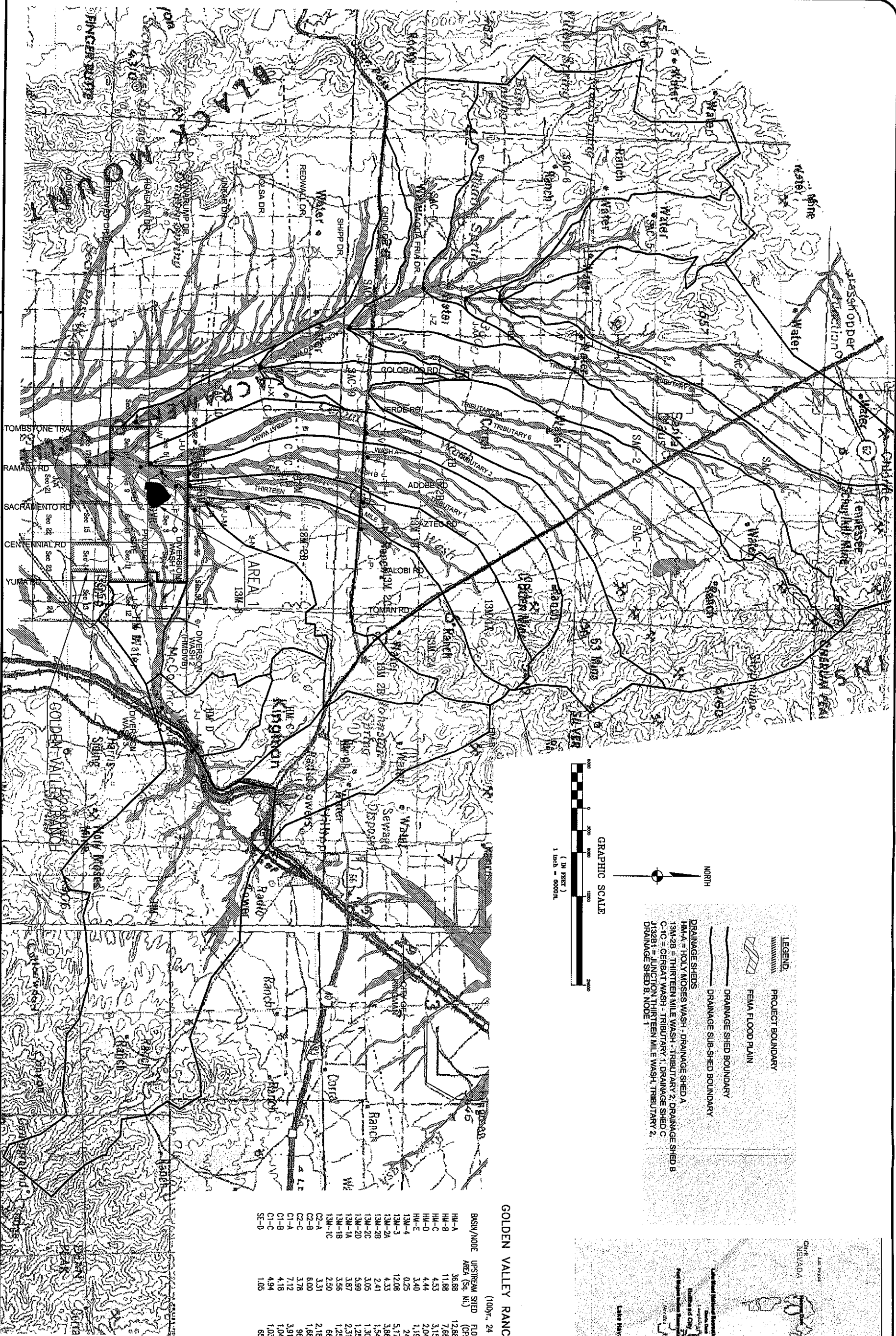
2. SITE DESCRIPTION

2.1. Description of Property

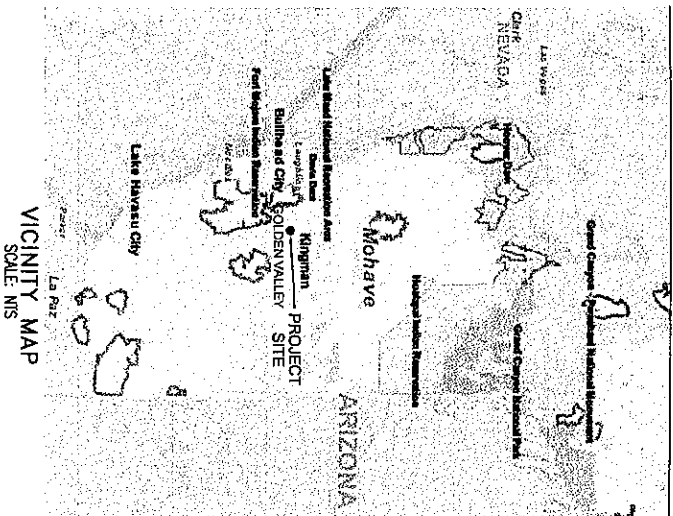
The property is semiarid rangeland with a covering of desert shrub in poor condition. Area 2, Phases A & B is located primarily in the west half of Section 3, Township 20 North, Range 18



Stanley Consultants INC.
5820 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396



- LEGEND**
- PROJECT BOUNDARY
 - FEMA FLOOD PLAIN
 - DRAINAGE SHED BOUNDARY
 - DRAINAGE SUB-SHED BOUNDARY
- DRAINAGE SHEDS**
- HM-A = HOLY MOSES WASH - DRAINAGE SHED A
 - HM-B = HOLY MOSES WASH - DRAINAGE SHED B
 - HM-C = HOLY MOSES WASH - DRAINAGE SHED C
 - HM-D = HOLY MOSES WASH - DRAINAGE SHED D
 - HM-E = HOLY MOSES WASH - DRAINAGE SHED E
 - HM-F = HOLY MOSES WASH - DRAINAGE SHED F
 - HM-G = HOLY MOSES WASH - DRAINAGE SHED G
 - HM-H = HOLY MOSES WASH - DRAINAGE SHED H
 - HM-I = HOLY MOSES WASH - DRAINAGE SHED I
 - HM-J = HOLY MOSES WASH - DRAINAGE SHED J
 - HM-K = HOLY MOSES WASH - DRAINAGE SHED K
 - HM-L = HOLY MOSES WASH - DRAINAGE SHED L
 - HM-M = HOLY MOSES WASH - DRAINAGE SHED M
 - HM-N = HOLY MOSES WASH - DRAINAGE SHED N
 - HM-O = HOLY MOSES WASH - DRAINAGE SHED O
 - HM-P = HOLY MOSES WASH - DRAINAGE SHED P
 - HM-Q = HOLY MOSES WASH - DRAINAGE SHED Q
 - HM-R = HOLY MOSES WASH - DRAINAGE SHED R
 - HM-S = HOLY MOSES WASH - DRAINAGE SHED S
 - HM-T = HOLY MOSES WASH - DRAINAGE SHED T
 - HM-U = HOLY MOSES WASH - DRAINAGE SHED U
 - HM-V = HOLY MOSES WASH - DRAINAGE SHED V
 - HM-W = HOLY MOSES WASH - DRAINAGE SHED W
 - HM-X = HOLY MOSES WASH - DRAINAGE SHED X
 - HM-Y = HOLY MOSES WASH - DRAINAGE SHED Y
 - HM-Z = HOLY MOSES WASH - DRAINAGE SHED Z



GOLDEN VALLEY RANCH - WASH FLOW SUMMARY

(100yr, 24 hr PRECIPITATION)		UPSTREAM SITE		UPSTREAM SITE	
		AREA (Sq. Mi.)		AREA (Sq. Mi.)	
HM-A	11.68	12.887	J-A	136.79	18.556
HM-B	4.33	7.668	J-B	76.07	9.961
HM-C	4.44	3.194	J-C	67.37	8.261
HM-D	4.44	2.042	J-D	51.13	7.303
HM-E	0.25	1.197	J-E	38.04	6.457
HM-F	0.25	2.42	J-F	60.72	4.141
HM-G	12.08	5.177	J-G	57.32	14.363
HM-H	4.33	3.662	J-H	52.88	15.344
HM-I	2.41	1.340	J-I	48.36	15.344
HM-J	3.05	1.304	J-J	12.08	5.177
HM-K	5.99	1.265	J-K	15.78	2.339
HM-L	3.87	2.319	J-L	9.76	2.746
HM-M	3.56	1.255	J-M	7.39	2.101
HM-N	2.50	680	J-N	9.83	1.023
HM-O	3.31	2.184	J-O	7.43	1.321
HM-P	6.00	1.687	J-P	11.29	2.452
HM-Q	3.76	964	J-Q	153.19	14.170
HM-R	3.76	964	J-R	149.13	12.435
HM-S	7.12	3.913	J-S	80.69	11.880
HM-T	4.18	1.046	J-T	55.04	9.265
HM-U	4.94	1.035	J-U	33.50	6.188
HM-V	1.05	655	J-V		
HM-W			J-W		
HM-X			J-X		
HM-Y			J-Y		
HM-Z			J-Z		
HM-AA			J-AA		
HM-BB			J-BB		

GOLDEN VALLEY SOUTH
VICINITY MAP AND REGIONAL DRAINAGE SCHEME
TECHNICAL DRAINAGE STUDY EXHIBIT

MOHAVE COUNTY

ARIZONA

FIGURE 1

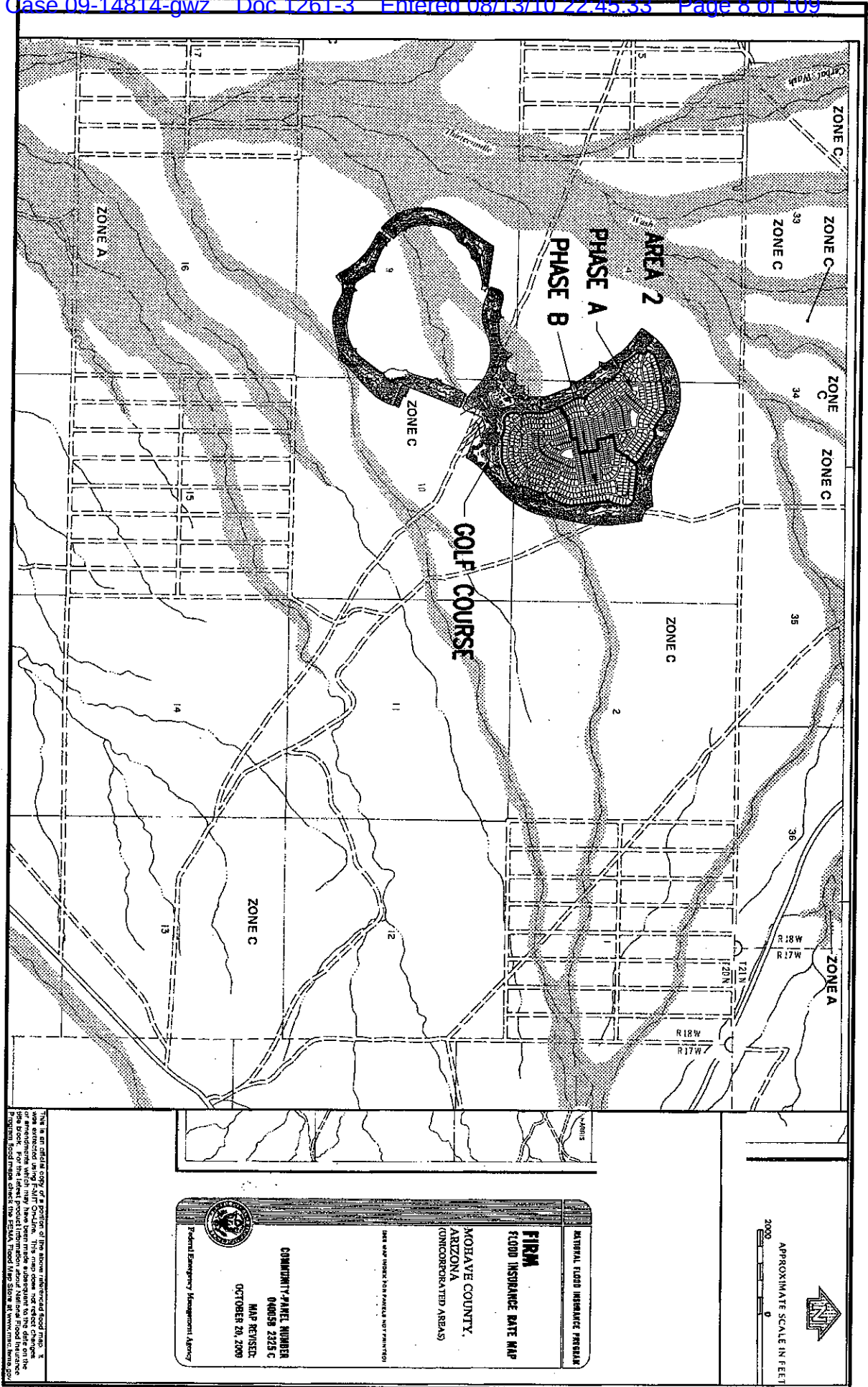


FIGURE 2
AREA 2

GOLDEN VALLEY RANCH

West, G&SRM, with minor portions in Sections 2 and 10. The project will be developed into a residential community consisting of single-family (7,000 square foot lots) residences, streets, golf course and open spaces.

2.2. Drainage Descriptions

Area 2, Phases A & B is situated between the Thirteen Miles Wash and the Holy Moses Wash. Small braided channels traverse the site and a diversion channel from the Holy Moses Wash (Diversion Wash 1) crosses in a southwesterly direction across the site. The project lies on westerly sloping alluvial fan originating from the Cerbat Mountains.

Rainfall runoff generated within the development travels from the individual residential lot or open space to the street. The street is the main mean of runoff conveyance until runoff exceeds the street capacity with an 8 inch depth. When that happens, runoff is received into an underground storm drainage system, into a drainage swale or channel. The storm drainage system is sized to convey a minimum of the 10-yr, 6-hr storm runoff. Runoff generally drains in a westerly direction toward one of six release points. Here, it is received into a storm drainage system and discharged into the golf course. Major runoff travels within the golf courses fairways to be collected and conveyed under the West Loop Road at the Areas southwest corner. It returns to an open channel and discharged into one of the braided washes draining into the Thirteen Mile Wash, a tributary of the Sacramento Wash.

Area 2, Phases A & B is divided into thirty-seven small sub-sheds, ranging in size from approximately 1 acre to 13 acres (See Figure 3). The sunken golf course encompasses the Area 2 development. Shed P2-67 discharges into the south leg of the golf course and travels south away from the site. The remaining 192.38 acres drain west in a westerly direction into the golf course at five points. Four of these discharge into the west leg of the golf course (between Areas 1 & 2) and flow in a northerly direction to a culvert under the West Loop Road (south of the intersection of West Loop Rd and B2 Street). The other release point drains into the north leg of the golf course (paralleling West Loop Rd.), combining with runoff from Area 3, Shed P3-44 and future Areas 61 and 62. All releases into the golf course are through bubble-up structures with low flow drains tied into the golf course underdrain system. The fairway provides conveyance for major runoff and also storage to retard the peak flow. Runoff exits the golf course via a culvert under the West Loop Road and is conveyed to the Thirteen Mile Wash through an open channel.

3. METHODS AND CRITERIA**3.1. Methodology**

The HEC-HMS model was used for the simulation of flood events in watersheds and river basins. This computer model simulates the surface runoff response of a drainage basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Each component models an aspect of the rainfall-runoff process within a portion of

LEGENDS:

———— SHED BOUNDARY

———— SUB-SHED BOUNDARY (P1-99)

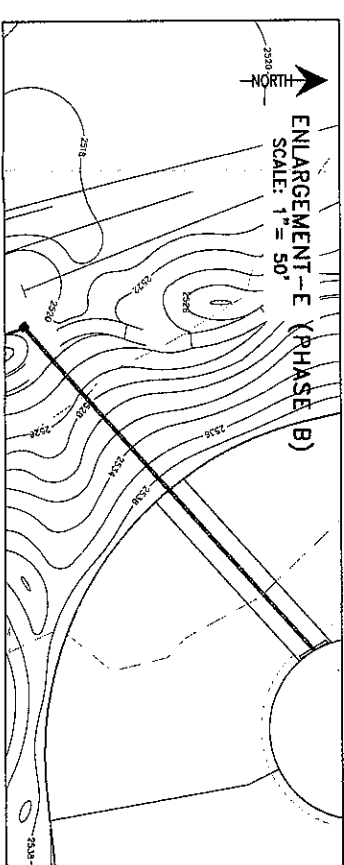
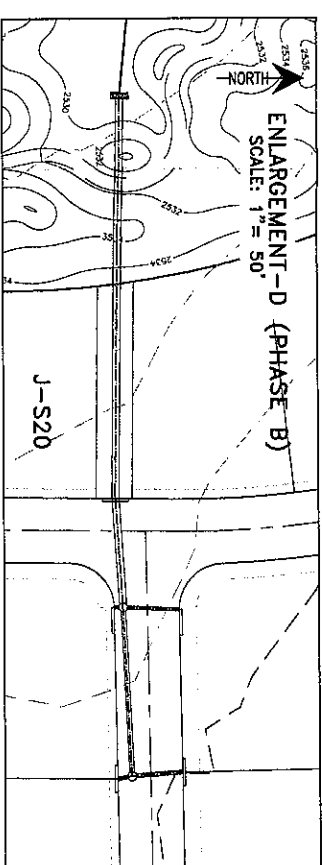
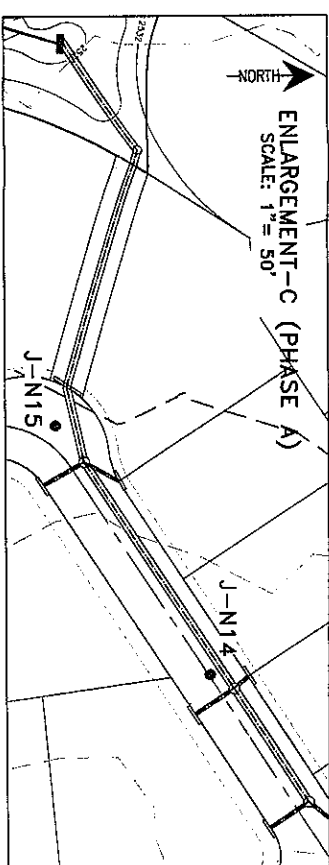
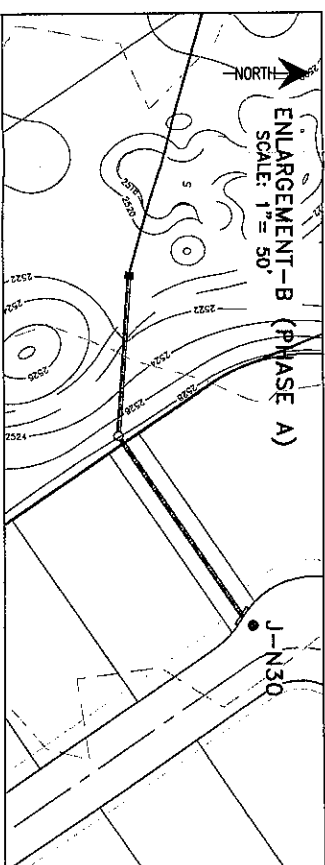
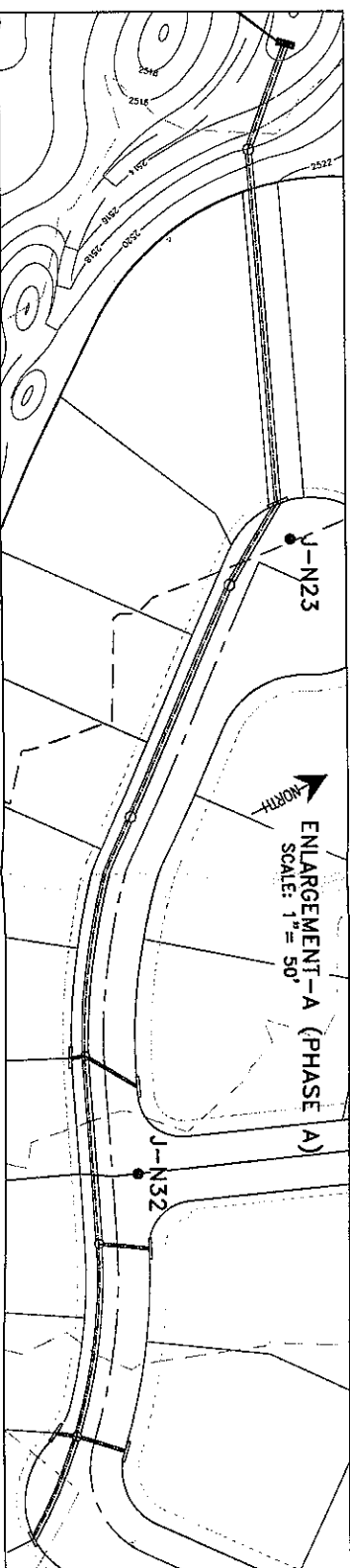
● JUNCTION POINT (J-C9)

———— PROPOSED CHANNEL

———— PROPOSED PIPE

———— STORM DRAIN PIPE

———— STORM DRAIN INLET



GOLDEN VALLEY RANCH

the whole basin. This basin portion is referred to as a sub-basin. The runoff hydrographs of each sub-basin are then combined and a final discharge hydrograph is obtained. It was chosen as the hydrology model since it is the model used in a Preliminary Federal Insurance Study prepared for Mohave County Flood Control District, October 2005 for various watersheds in the Golden Valley and Kingman, AZ areas. This adds consistency and reliability in the methodology. Modified-Puls routing in the HEC-HMS model allows for retardation of peak flows within the broad flood way of the golf course.

HEC-RAS, another program from the COE, provides a steady state flow analysis to determine water surface elevations within a defined channel or flood plain. Volume computations within the HEC-RAS program were utilized in developing flow routing by Modified-Puls methods.

Water Surface Pressure Gradient (WSPG) program developed by the Los Angeles County Flood Control District. WSPG is a similar program to HEC-RAS in that it develops the water surface elevations and other channel parameters, but is better adapted to closed (pressure) conduit flow and is therefore used in the evaluation of the stormwater infrastructure system.

Calculations for street capacity are produced using the FlowMaster by Haestad Methods, Inc. Inlet calculations are performed using Federal Highway Administration's Visual Urban program for pavement drainage.

3.2. Drainage Shed and Modeling Convention

The basic naming convention of the basins for the exhibits and model are based around the individual drainage shed of the development. Sheds are labeled as P2-34, identifying Area 2, Shed 34. Junction points or points of runoff confluence are identified as J-N12, identifying that it is a junction point and a label. An R designates a routing of a shed or junction, therefore R-JN15 represents routing of junction JN15 to another point.

3.3. Design Storm and Precipitation

Local jurisdiction requires that water sheds less than 20 square miles be evaluated for the 6-hour local storm. Drainage sheds of 20 to 100 square miles are to be evaluated for both the 6-hour and 24-hour rainfall events. Areas from 20 square miles to 500 square miles are considered general storms and are evaluated for the 24-hour precipitation.

Maricopa County Flood Control District has developed storm distribution curves associated with drainage shed size. Since the total area of Area 2, Phases A & B is less than 1 square mile, Pattern 1 of the Maricopa County 6-Hour Mass Curve was utilized for the storm distribution. Precipitation values of 3.00-inches and 1.76-inches were taken from the National Oceanographic and Atmospheric Administration National Weather Service's Atlas 14. Table 1 provides the precipitation values from NOAA Atlas 14. Since the total area of Area 2 is 0.29 square miles (187 acres) the depth-area reduction factor was not applied.

GOLDEN VALLEY RANCH**Table 1 - Precipitation**

Recurrence Interval (yrs)	5 min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr
10-yr	0.40	0.61	0.75	1.01	1.25	1.44	1.53	1.76
100-yr	0.65	0.98	1.22	1.64	2.03	2.44	2.67	3.00

3.4. Soils

Soils information is taken from the Natural Resources Conservation Service, Soil Data Mart. Soils within Area 1, Phases A & B consist of CACIQUE-BUCKLEBAR-ALKO (AZ039) type. These soils have a hydrologic soil type designation of "C".

3.5. Model Data and Results

Table 2 summarizes runoff at junction points and drainage sheds within Area 2, Phases A & B. Runoff values are rounded to the nearest 1 cfs.

GOLDEN VALLEY RANCH

Table 5 –Flow Summary

Element	Area (sq mi)	Peak Discharge 100-yr (cfs)	Peak Discharge 10-yr (cfs)	Element	Area (sq mi)	Peak Discharge 100-yr (cfs)	Peak Discharge 10-yr (cfs)
J-N10	0.0057	11.48	4.06	P2-58	0.0087	16.02	5.78
J-N11	0.0229	43.44	14.9	P2-59	0.0092	15.72	5.55
J-N12	0.0403	77.1	26.86	P2-60	0.0113	20.95	7.58
J-N13	0.0523	99.06	34.19	P2-61	0.0064	10.69	3.79
J-N14	0.0627	116.7	39.96	P2-62	0.0121	21.13	7.51
J-N15	0.0728	135.07	46.15	P2-63	0.0063	11.8	4.29
J-N18	0.0118	22.79	8.09	P2-64	0.0126	23.81	8.7
J-N19	0.0131	24.65	8.74	P2-65	0.0019	4.34	1.62
J-N20	0.0184	33.63	12.1	P2-66	0.0139	23.21	8.24
J-N21	0.0279	54.34	18.32	P2-67	0.0197	51.02	18.82
J-N22	0.0393	75.78	25.74	P2-68	0.0066	12.47	4.56
J-N23	0.0589	111.05	37.37	P2-69	0.009	16.41	5.9
J-N26	0.0134	26.39	9.63	P2-70	0.02	37.66	13.76
J-N27	0.0687	114.34	38.95	P2-71	0.0067	13.51	4.81
J-N30	0.0221	39.52	13.55	P2-72	0.0104	18.09	6.42
J-N31	0.0454	87.5	29.9	P2-73	0.0101	19	6.94
J-N32	0.0523	99.42	33.96	P2-74	0.0092	17.97	6.41
J-N6	0.0261	43.47	14.05	P2-75	0.0059	13.01	4.76
J-N7	0.0411	70.44	23.07	P2-76	0.0109	20.12	7.27
J-N8	0.0503	83.94	28.36	P2-77	0.0051	10.49	3.76
J-S17	0.016	29.75	10.85	P2-78	0.0076	17.06	6.3
J-S18	0.0311	57.82	20.99	P2-79	0.0064	14.34	5.29
J-S19	0.0581	107.35	37.57	P2-80	0.0034	7.27	2.63
J-S20	0.0781	136.47	47.93	P2-81	0.0172	32.11	11.66
J-S21	0.0131	26.89	9.85	P2-82	0.008	17.17	6.22
				P2-83	0.012	22.36	8.12
				P2-84	0.0094	19.77	7.12
				P2-85	0.0052	11.07	4
				P2-86	0.0024	5.19	1.88
				P2-87	0.0094	17.76	6.49
				P2-88	0.0013	2.34	0.84
				P2-89	0.0114	25.59	9.44
				P2-90	0.0071	15.51	5.65
				P2-91	0.0023	4.78	1.71
				P2-92	0.0082	16.62	5.93
				P2-93	0.0061	12.55	4.49
				P2-94	0.0069	15.55	5.75

It should be noted that the precipitation depths of the 100-yr, 6-hr event is 3-inches and that the precipitation depth of the 10-yr, 6-hr storm is 1.53-inches. The 100-yr precipitation is nearly twice for the 10-yr event. For the same events the amount of excess precipitation available for runoff is dependent on the runoff curve number, which is a function of soil type, land use, and antecedent moisture conditions. For this reason a larger portion of the 100-yr precipitation is available for runoff than for the smaller 10-yr storm and the ratio of peak runoff for the 100-yr precipitation to 10-yr precipitations is nearly 3.

All model results and input data are found in the Appendices of this study. They consist of the following:

GOLDEN VALLEY RANCH

- Appendix A – Model Results and Data provides the input parameters and results for Area 2, Phases A & B sheds.
- Appendix B – Drainage Infrastructure provides the storm drain inlet calculations open channel flow calculations through utility easements.
- Appendix C – Street Capacity Calculations
- Appendix D – Public Right-of-Way Drainage Improvements

4. Drainage Improvements within the Public Right-of-Way

Access to the project site is via Shinarump Road from the north to the new Aztec Road alignment and West Loop Road. Aztec Road will receive a culvert crossing at the Power line Easement to convey runoff from off-site areas to the Thirteen Mile Wash. The West Loop Road will have a pipe crossing from the Open Space area of Area 2, Phase 1 and convey this and other Area 2, Phases 1 & 2 runoff south, crossing a future portion of the West Loop Road and discharging into the golf course (See Figure 4). Discharge from Area 1, Phases A & B drainage sheds are discussed in Section 2.2 of the Drainage Study of Area 1, Phases A & B.

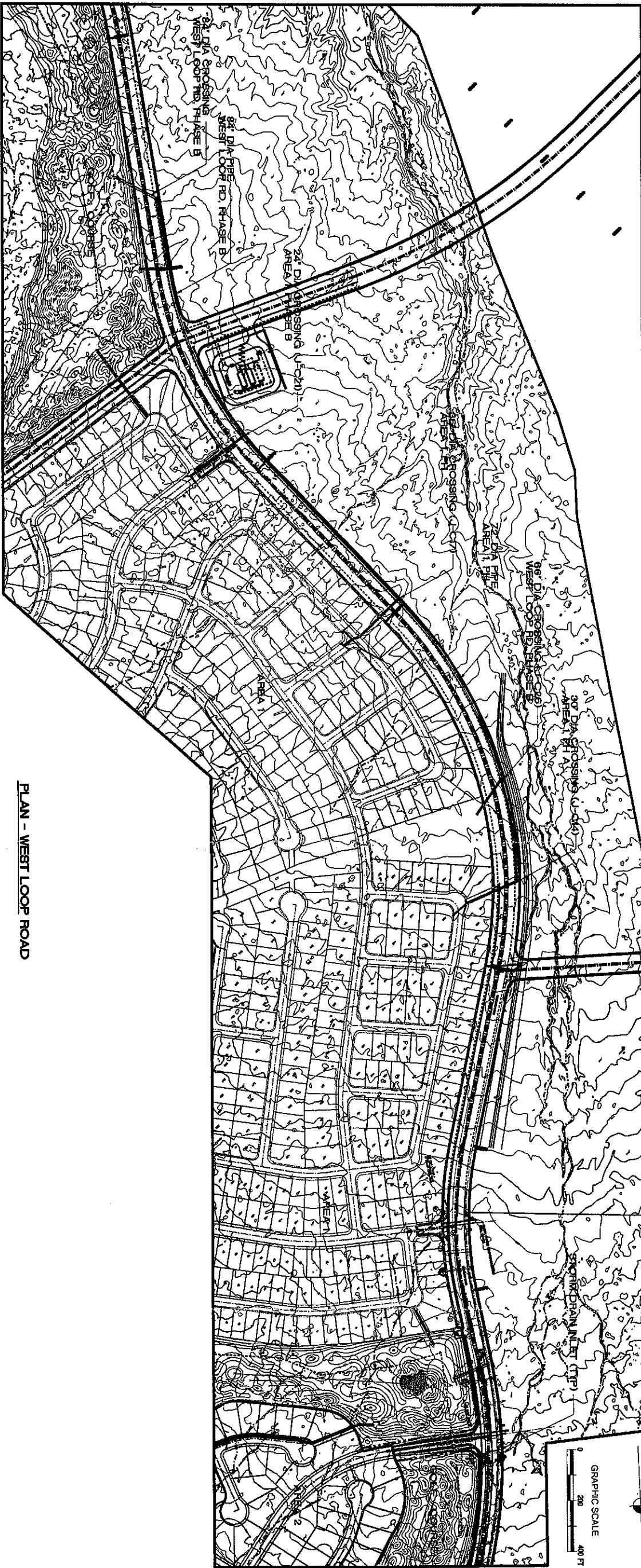
Appendix D contains street capacity calculations for the arterial roads and inlet capacity calculations.

5. Comparison of Flows

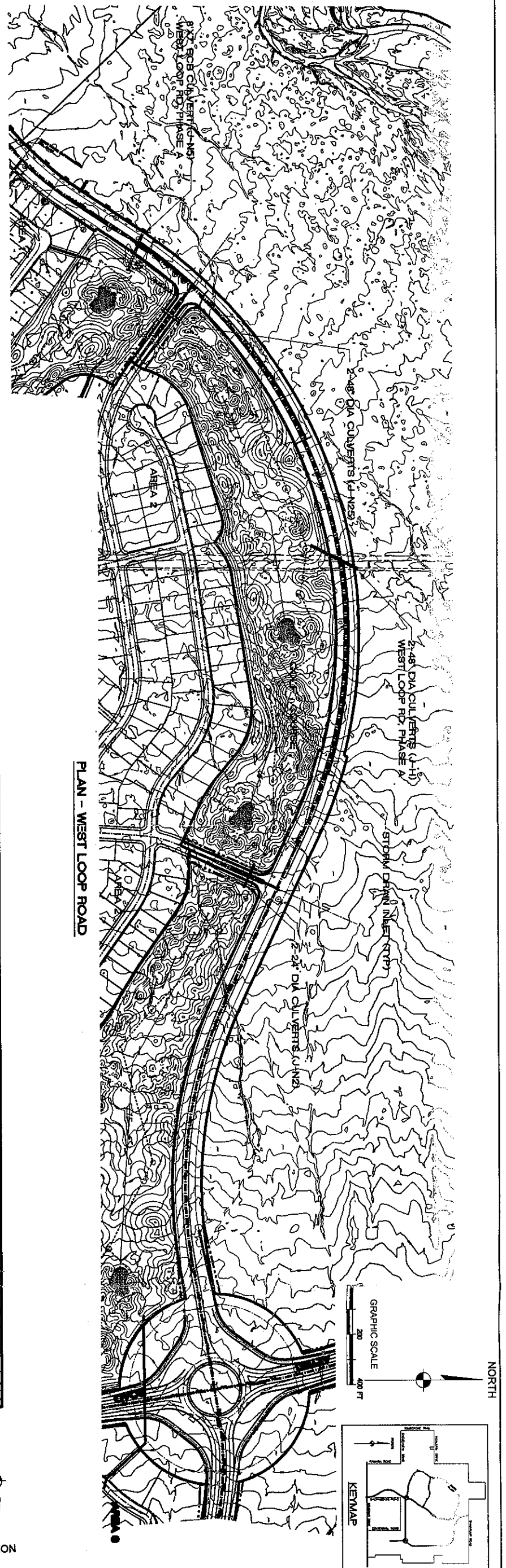
The drainage shed characteristics change with development of existing lands. The pervious soils that formerly existed become less pervious with the addition of houses, streets, and sidewalks and the time for runoff to reach its release point shortens. From a drainage point of view, one of the major advantages to the adjacent golf course is that drainage runoff is routed through its fairway system. This not only allows for runoff of the major storm events, but also allows for the golf course to absorb some for the runoff volume, therefore reducing the peak flow. Figure 5 shows existing drainage as it relates to the Area 1-3 development and outside areas that will drain through the proposed system. Table 3 provides a comparison of existing flows to developed flow at major junction points. Note that runoff from the northern release point J-N5 exceeds its existing flow into the Thirteen Mile Wash, the collective flows from J-N5 and J-S26 less than existing due to detention provided within the golf course.

Table 3 – Flow Comparison

Shed	Area (acres)	Indirect Methods (cfs)	HEC- HMS (cfs)
J-H	73.26	191	211
J3-44	18.12	73	38
J-S5	69.79	184	187
J-S9	439.35	657	456
J-N5	369.78	582	621
J-S26	713.82	916	798



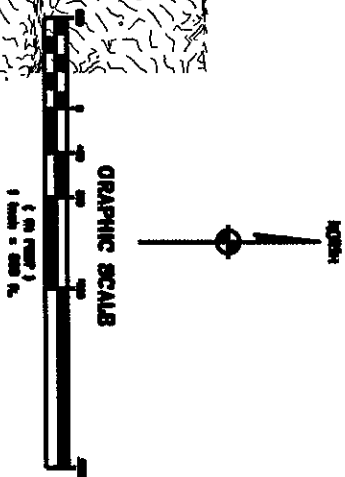
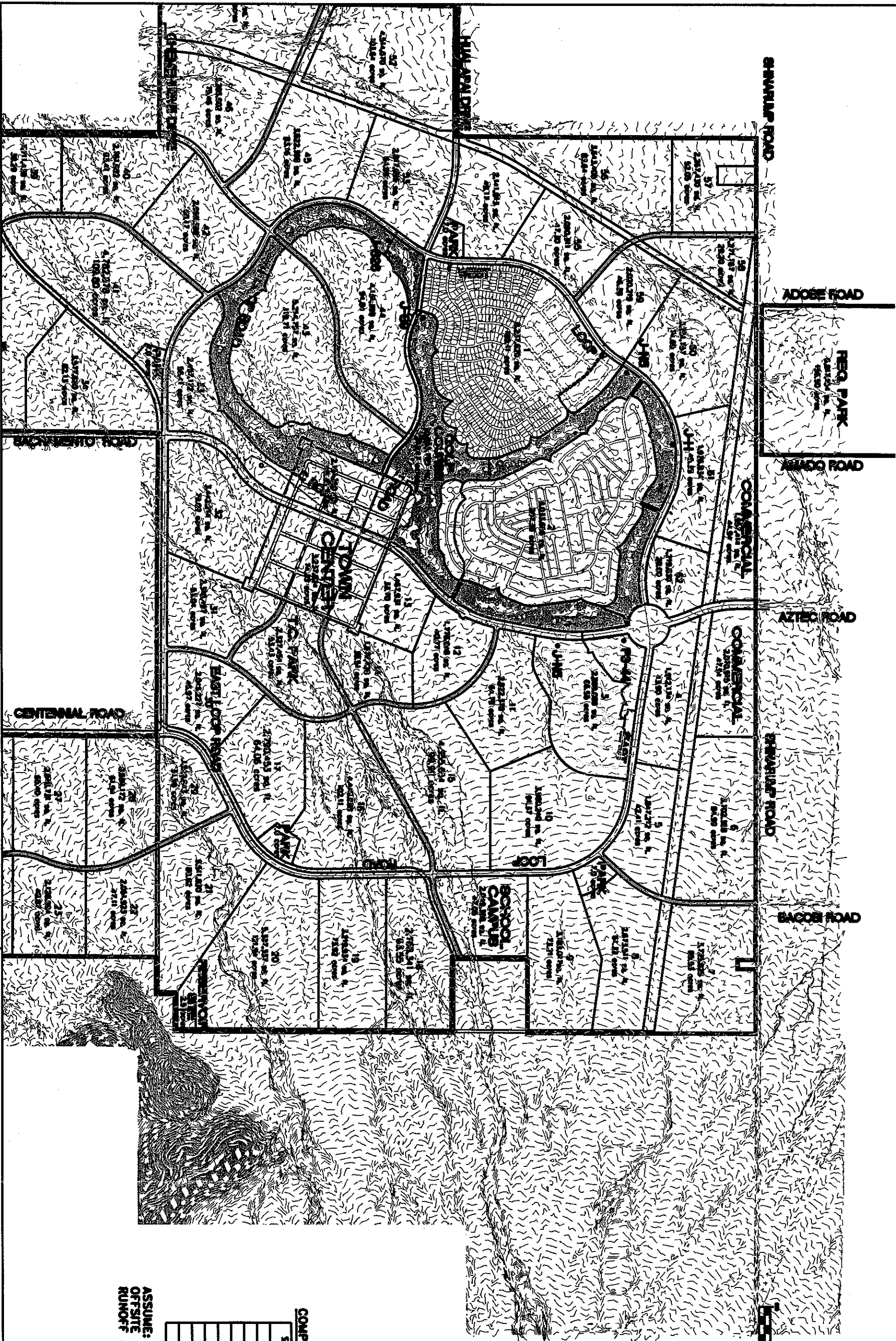
PLAN - WEST LOOP ROAD



PLAN - WEST LOOP ROAD



Stanley Consultants INC.
5600 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 599-9395



COMPARISON OF FLOW

SECTION	EXISTING FLOWS	DEVELOPED FLOWS
PJ-41	73	88
J-53	140	87
J-53	66	45
J-41	81	211
J-45	52	61
J-53	916	78

ASSUME: PROPOSED LOOP ROADS DIVERT
OFFSITE RUNOFF AWAY FROM PROJECT
RUNOFF = (100 YRS. 6 HRS.)

GOLDEN VALLEY RANCH
EXISTING DRAINAGE AND PROPOSED OFFSITE IMPROVEMENTS
TECHNICAL DRAINAGE STUDY EXHIBIT

MOHAVE COUNTY

ARIZONA

FIGURE 5

GOLDEN VALLEY RANCH**6. FEMA Base Flood Elevations**

The Holy Moses Diversion Wash #1 leaves the main channel east of the site. It travels in a westerly direction along the westerly sloping alluvial fan. The runoff generally remains within the washes banks, but as it reaches the channel edge it spills over into the surrounding dessert plain. Overtime the cresting and release of flow along with its sediment load has formed a channel with overbanks sloping away from the channel.

A HEC-RAS analysis provides the Base Flood Elevations (BFE) for this diversion wash. The base flood flow within Holy Moses Diversion Wash # 1 is based on derived flow from the Technical Drainage Study for Golden Valley Ranch, Mohave, Arizona, dated October 2005. Finish building grades are developed to remain 1 foot to 1.5 feet above the BFE. Figure 6 shows the BFE's for development in Areas 1-3.

7. SUMMARY

This study develops specific criteria and flow for the development of Area 1, Phases A & B.

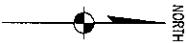
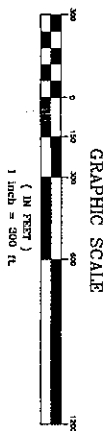
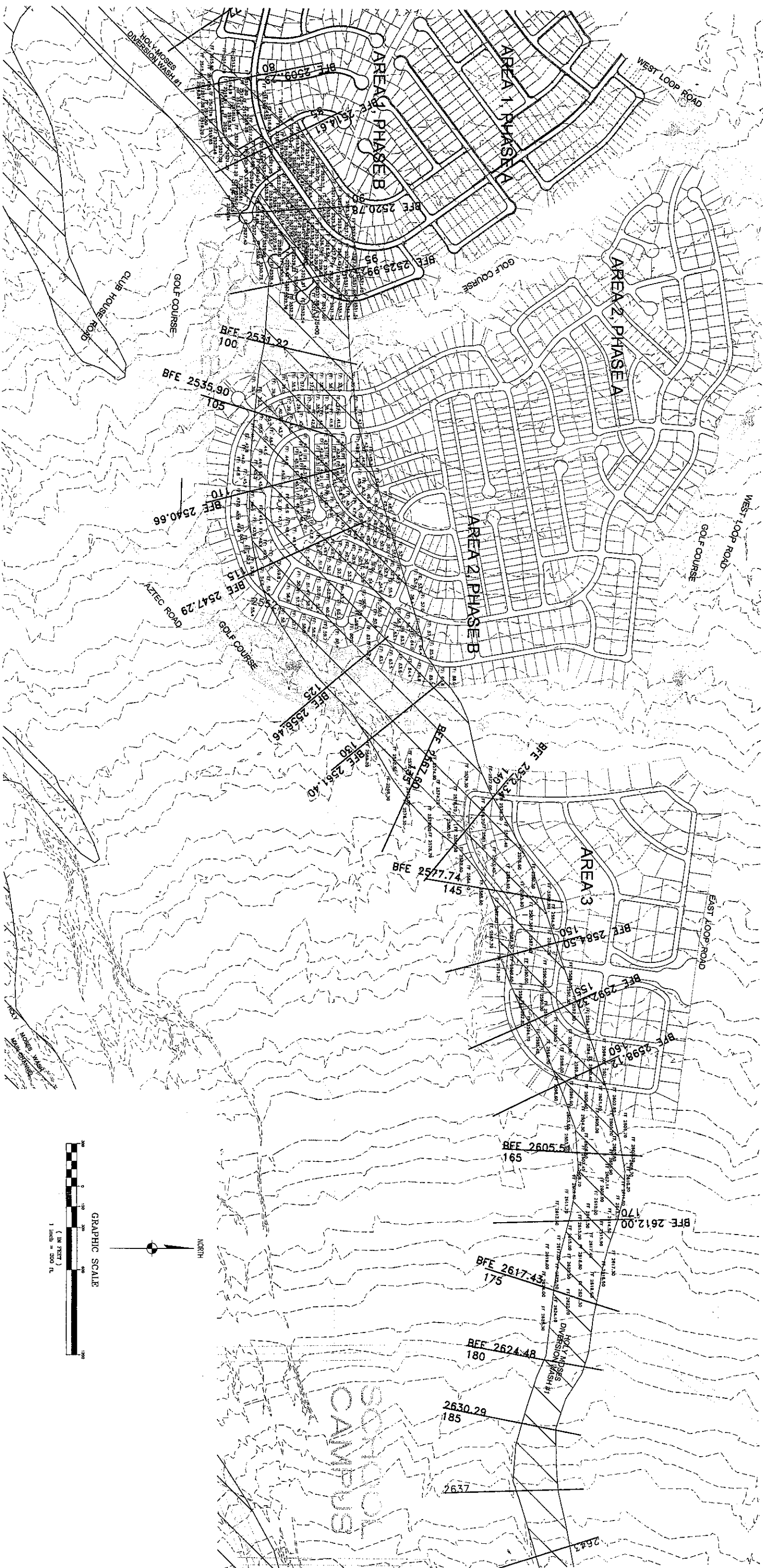
- The majority of the development runoff can be maintained and conveyed within the street right-of-way. Where street flow capacity is reached, a storm drainage system is required.
- The drainage infrastructure is capable of conveying the 10-yr, 6-hr storm event (minimum).
- The adjacent golf course services as runoff conveyance and storage.
- Total discharge from the collective Areas 1-3 to the Thirteen Mile Wash is less because of the use of runoff volume storage provided in the golf course.
- Conveyance of stormwater runoff within the golf course fairways allows for some ground water recharge.

8. REFERENCES

- 1) *Flood Insurance Rate Map*, Community Panel Number 040058 2325 C, Mohave County, Arizona, effective October 20, 2002.
- 2) *Highway Drainage Design Manual*, Arizona Department of Transportation, Report Number FHWA-AZ93-281, Final Report, March, 1993
- 3) *Drainage Design Manual for Maricopa County, Arizona*, Hydrology: Rainfall, Flood Control District of Maricopa County, November 2003



Stanley Consultants Inc.
5820 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396



LEGEND:
FEMA FLOOD PLAIN
BFE 2598.12 BASE FLOOD ELEVATION
125 CROSS-SECTION (HEC-RAS MODEL)

GOLDEN VALLEY RANCH
HOLY MOSES DIVERSION WASH #1 (BASE FLOOD ELEVATIONS)
TECHNICAL DRAINAGE STUDY EXHIBIT

MOHAVE COUNTY

ARIZONA

FIGURE 6

GOLDEN VALLEY RANCH

APPENDIX A

AREA 2 – RESULTS AND DATA

- **HEC-HMS 100-YR, 6-HR SIMULATION**
- **HEC-HMS 10-YR, 6-HR SIMULATION**
- **NOAA ATLAS 14 PRECIPITATION**
- **STANDARD FORM 4**

Project: Pod2_S_curve Simulation Run: Pod2-100yr

Start of Run: 01Jan3000, 01:00 Basin Model: POD2
 End of Run: 02Jan3000, 01:55 Meteorologic Model: S-Pattern 1(3.00in)
 Execution Time: 15Mar2006, 10:40:05 Control Specifications: Control 1

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
J-N10	0.0057	11.48	01Jan3000, 05:10	0.57
J-N11	0.0229	43.44	01Jan3000, 05:15	2.31
J-N12	0.0403	77.10	01Jan3000, 05:15	4.07
J-N13	0.0523	99.06	01Jan3000, 05:15	5.28
J-N14	0.0627	116.70	01Jan3000, 05:15	6.34
J-N15	0.0728	135.07	01Jan3000, 05:15	7.36
J-N18	0.0118	22.79	01Jan3000, 05:15	1.19
J-N19	0.0131	24.65	01Jan3000, 05:15	1.32
J-N20	0.0184	33.63	01Jan3000, 05:15	1.85
J-N21	0.0279	54.34	01Jan3000, 05:15	2.81
J-N22	0.0393	75.78	01Jan3000, 05:10	3.96
J-N23	0.0589	111.05	01Jan3000, 05:15	5.96
J-N26	0.0134	26.39	01Jan3000, 05:10	1.35
J-N27	0.0687	114.34	01Jan3000, 05:15	6.92
J-N30	0.0221	39.52	01Jan3000, 05:15	2.23
J-N31	0.0454	87.50	01Jan3000, 05:10	4.58
J-N32	0.0523	99.42	01Jan3000, 05:10	5.29
J-N6	0.0261	43.47	01Jan3000, 05:15	2.63
J-N7	0.0411	70.44	01Jan3000, 05:15	4.14
J-N8	0.0503	83.94	01Jan3000, 05:20	5.06
J-S17	0.0160	29.75	01Jan3000, 05:15	1.61
J-S18	0.0311	57.82	01Jan3000, 05:15	3.13
J-S19	0.0581	107.35	01Jan3000, 05:15	5.85
J-S20	0.0781	136.47	01Jan3000, 05:15	7.85
J-S21	0.0131	26.89	01Jan3000, 05:10	1.32

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
P2-58	0.0087	16.02	01Jan3000, 05:15	0.88
P2-59	0.0092	15.72	01Jan3000, 05:15	0.93
P2-60	0.0113	20.95	01Jan3000, 05:15	1.14
P2-61	0.0064	10.69	01Jan3000, 05:15	0.64
P2-62	0.0121	21.13	01Jan3000, 05:15	1.22
P2-63	0.0063	11.80	01Jan3000, 05:15	0.63
P2-64	0.0126	23.81	01Jan3000, 05:10	1.27
P2-65	0.0019	4.34	01Jan3000, 05:10	0.19
P2-66	0.0139	23.21	01Jan3000, 05:15	1.40
P2-67	0.0197	51.02	01Jan3000, 05:05	1.99
P2-68	0.0066	12.47	01Jan3000, 05:10	0.67
P2-69	0.0090	16.41	01Jan3000, 05:15	0.91
P2-70	0.0200	37.66	01Jan3000, 05:15	2.02
P2-71	0.0067	13.51	01Jan3000, 05:10	0.68
P2-72	0.0104	18.09	01Jan3000, 05:15	1.05
P2-73	0.0101	19.00	01Jan3000, 05:15	1.02
P2-74	0.0092	17.97	01Jan3000, 05:10	0.93
P2-75	0.0059	13.01	01Jan3000, 05:10	0.59
P2-76	0.0109	20.12	01Jan3000, 05:15	1.10
P2-77	0.0051	10.49	01Jan3000, 05:10	0.51
P2-78	0.0076	17.06	01Jan3000, 05:10	0.77
P2-79	0.0064	14.34	01Jan3000, 05:10	0.64
P2-80	0.0034	7.27	01Jan3000, 05:10	0.34
P2-81	0.0172	32.11	01Jan3000, 05:15	1.73
P2-82	0.0080	17.17	01Jan3000, 05:10	0.81
P2-83	0.0120	22.36	01Jan3000, 05:15	1.21
P2-84	0.0094	19.77	01Jan3000, 05:10	0.95
P2-85	0.0052	11.07	01Jan3000, 05:10	0.52
P2-86	0.0024	5.19	01Jan3000, 05:10	0.24
P2-87	0.0094	17.76	01Jan3000, 05:10	0.95
P2-88	0.0013	2.34	01Jan3000, 05:15	0.13
P2-89	0.0114	25.59	01Jan3000, 05:10	1.15

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
P2-90	0.0071	15.51	01Jan3000, 05:10	0.72
P2-91	0.0023	4.78	01Jan3000, 05:10	0.23
P2-92	0.0082	16.62	01Jan3000, 05:10	0.83
P2-93	0.0061	12.55	01Jan3000, 05:10	0.61
P2-94	0.0069	15.55	01Jan3000, 05:10	0.70
R-JN10	0.0057	11.33	01Jan3000, 05:15	0.57
R-JN11	0.0229	42.95	01Jan3000, 05:15	2.31
R-JN12	0.0403	76.70	01Jan3000, 05:15	4.07
R-JN13	0.0523	98.60	01Jan3000, 05:15	5.29
R-JN14	0.0627	116.07	01Jan3000, 05:15	6.35
R-JN18	0.0118	22.31	01Jan3000, 05:15	1.19
R-JN19	0.0131	23.99	01Jan3000, 05:20	1.32
R-JN21	0.0279	54.14	01Jan3000, 05:15	2.82
R-JN22	0.0393	74.95	01Jan3000, 05:10	3.97
R-JN26	0.0134	26.31	01Jan3000, 05:15	1.35
R-JN31	0.0454	86.20	01Jan3000, 05:15	4.59
R-JN32	0.0523	98.61	01Jan3000, 05:15	5.29
R-JN6	0.0261	42.62	01Jan3000, 05:15	2.63
R-JN7	0.0411	68.85	01Jan3000, 05:20	4.13
R-JN8	0.0503	83.83	01Jan3000, 05:20	5.07
R-JS17	0.0160	29.65	01Jan3000, 05:15	1.61
R-JS18	0.0311	57.72	01Jan3000, 05:15	3.13
R-JS19	0.0581	104.46	01Jan3000, 05:20	5.84
R-JS21	0.0131	26.42	01Jan3000, 05:15	1.32
R-P260	0.0113	20.53	01Jan3000, 05:15	1.14
R-P261	0.0064	10.49	01Jan3000, 05:20	0.65
R-P265	0.0019	4.27	01Jan3000, 05:15	0.19
R-P279	0.0064	13.64	01Jan3000, 05:15	0.64
R-P282	0.0080	16.48	01Jan3000, 05:15	0.81
R-P285	0.0052	10.75	01Jan3000, 05:15	0.52
R-P286	0.0024	5.07	01Jan3000, 05:15	0.24
R-P291	0.0023	4.63	01Jan3000, 05:15	0.23

Project: Pod2_S_curve Simulation Run: Pod2-10yr

Start of Run: 01Jan3000, 01:00 Basin Model: POD2
 End of Run: 02Jan3000, 01:55 Meteorologic Model: S-Pattern 1(1.53in)
 Execution Time: 15Mar2006, 10:40:16 Control Specifications: Control 1

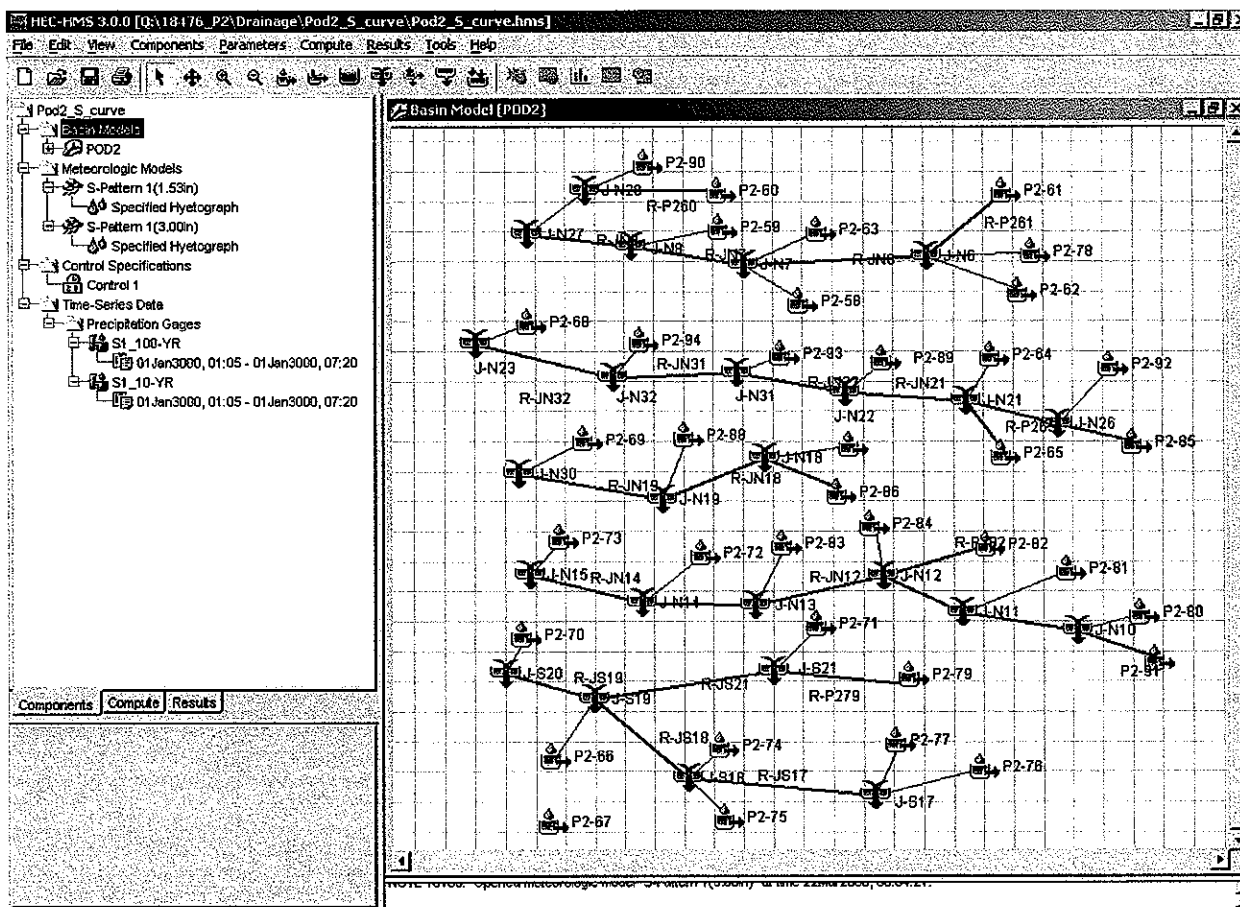
Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
J-N10	0.0057	4.06	01Jan3000, 05:15	0.20
J-N11	0.0229	14.90	01Jan3000, 05:15	0.80
J-N12	0.0403	26.86	01Jan3000, 05:15	1.41
J-N13	0.0523	34.19	01Jan3000, 05:15	1.83
J-N14	0.0627	39.96	01Jan3000, 05:15	2.19
J-N15	0.0728	46.15	01Jan3000, 05:15	2.55
J-N18	0.0118	8.09	01Jan3000, 05:15	0.41
J-N19	0.0131	8.74	01Jan3000, 05:20	0.46
J-N20	0.0184	12.10	01Jan3000, 05:15	0.64
J-N21	0.0279	18.32	01Jan3000, 05:15	0.97
J-N22	0.0393	25.74	01Jan3000, 05:15	1.37
J-N23	0.0589	37.37	01Jan3000, 05:15	2.06
J-N26	0.0134	9.63	01Jan3000, 05:15	0.47
J-N27	0.0687	38.95	01Jan3000, 05:20	2.40
J-N30	0.0221	13.55	01Jan3000, 05:20	0.77
J-N31	0.0454	29.90	01Jan3000, 05:15	1.59
J-N32	0.0523	33.96	01Jan3000, 05:15	1.83
J-N6	0.0261	14.05	01Jan3000, 05:20	0.91
J-N7	0.0411	23.07	01Jan3000, 05:15	1.43
J-N8	0.0503	28.36	01Jan3000, 05:20	1.75
J-S17	0.0160	10.85	01Jan3000, 05:15	0.56
J-S18	0.0311	20.99	01Jan3000, 05:15	1.08
J-S19	0.0581	37.57	01Jan3000, 05:20	2.03
J-S20	0.0781	47.93	01Jan3000, 05:20	2.73
J-S21	0.0131	9.85	01Jan3000, 05:15	0.46

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
P2-58	0.0087	5.78	01Jan3000, 05:15	0.30
P2-59	0.0092	5.55	01Jan3000, 05:15	0.32
P2-60	0.0113	7.58	01Jan3000, 05:15	0.39
P2-61	0.0064	3.79	01Jan3000, 05:20	0.22
P2-62	0.0121	7.51	01Jan3000, 05:15	0.42
P2-63	0.0063	4.29	01Jan3000, 05:15	0.22
P2-64	0.0126	8.70	01Jan3000, 05:15	0.44
P2-65	0.0019	1.62	01Jan3000, 05:10	0.07
P2-66	0.0139	8.24	01Jan3000, 05:20	0.48
P2-67	0.0197	18.82	01Jan3000, 05:05	0.69
P2-68	0.0066	4.56	01Jan3000, 05:15	0.23
P2-69	0.0090	5.90	01Jan3000, 05:15	0.31
P2-70	0.0200	13.76	01Jan3000, 05:15	0.70
P2-71	0.0067	4.81	01Jan3000, 05:10	0.23
P2-72	0.0104	6.42	01Jan3000, 05:15	0.36
P2-73	0.0101	6.94	01Jan3000, 05:15	0.35
P2-74	0.0092	6.41	01Jan3000, 05:15	0.32
P2-75	0.0059	4.76	01Jan3000, 05:10	0.21
P2-76	0.0109	7.27	01Jan3000, 05:15	0.38
P2-77	0.0051	3.76	01Jan3000, 05:10	0.18
P2-78	0.0076	6.30	01Jan3000, 05:10	0.26
P2-79	0.0064	5.29	01Jan3000, 05:10	0.22
P2-80	0.0034	2.63	01Jan3000, 05:10	0.12
P2-81	0.0172	11.66	01Jan3000, 05:15	0.60
P2-82	0.0080	6.22	01Jan3000, 05:10	0.28
P2-83	0.0120	8.12	01Jan3000, 05:15	0.42
P2-84	0.0094	7.12	01Jan3000, 05:10	0.33
P2-85	0.0052	4.00	01Jan3000, 05:10	0.18
P2-86	0.0024	1.88	01Jan3000, 05:10	0.08
P2-87	0.0094	6.49	01Jan3000, 05:15	0.33
P2-88	0.0013	0.84	01Jan3000, 05:15	0.05
P2-89	0.0114	9.44	01Jan3000, 05:10	0.40

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
P2-90	0.0071	5.65	01Jan3000, 05:10	0.25
P2-91	0.0023	1.71	01Jan3000, 05:10	0.08
P2-92	0.0082	5.93	01Jan3000, 05:10	0.29
P2-93	0.0061	4.49	01Jan3000, 05:10	0.21
P2-94	0.0069	5.75	01Jan3000, 05:10	0.24
R-JN10	0.0057	4.01	01Jan3000, 05:20	0.20
R-JN11	0.0229	14.43	01Jan3000, 05:20	0.80
R-JN12	0.0403	26.07	01Jan3000, 05:15	1.41
R-JN13	0.0523	33.53	01Jan3000, 05:15	1.83
R-JN14	0.0627	39.21	01Jan3000, 05:15	2.20
R-JN18	0.0118	7.96	01Jan3000, 05:20	0.41
R-JN19	0.0131	8.36	01Jan3000, 05:25	0.46
R-JN21	0.0279	18.06	01Jan3000, 05:15	0.98
R-JN22	0.0393	25.61	01Jan3000, 05:15	1.37
R-JN26	0.0134	9.14	01Jan3000, 05:15	0.47
R-JN31	0.0454	29.35	01Jan3000, 05:15	1.59
R-JN32	0.0523	32.82	01Jan3000, 05:15	1.83
R-JN6	0.0261	14.01	01Jan3000, 05:20	0.91
R-JN7	0.0411	22.88	01Jan3000, 05:25	1.43
R-JN8	0.0503	28.04	01Jan3000, 05:20	1.76
R-JS17	0.0160	10.51	01Jan3000, 05:15	0.56
R-JS18	0.0311	20.66	01Jan3000, 05:20	1.08
R-JS19	0.0581	36.98	01Jan3000, 05:25	2.03
R-JS21	0.0131	9.64	01Jan3000, 05:15	0.46
R-P260	0.0113	7.28	01Jan3000, 05:20	0.39
R-P261	0.0064	3.77	01Jan3000, 05:25	0.22
R-P265	0.0019	1.56	01Jan3000, 05:20	0.07
R-P279	0.0064	5.15	01Jan3000, 05:15	0.22
R-P282	0.0080	6.11	01Jan3000, 05:15	0.28
R-P285	0.0052	3.87	01Jan3000, 05:15	0.18
R-P286	0.0024	1.80	01Jan3000, 05:20	0.08
R-P291	0.0023	1.68	01Jan3000, 05:15	0.08

GOLDEN VALLEY RANCH



Precipitation

Time	100-yr, 6-hr	10-yr, 6-hr
01Jan3000, 01:05	0	0
01Jan3000, 01:20	0.024	0.012
01Jan3000, 01:35	0.048	0.024
01Jan3000, 01:50	0.075	0.038
01Jan3000, 02:05	0.099	0.05
01Jan3000, 02:20	0.123	0.063
01Jan3000, 02:35	0.15	0.077
01Jan3000, 02:50	0.174	0.089
01Jan3000, 03:05	0.198	0.101
01Jan3000, 03:20	0.222	0.113
01Jan3000, 03:35	0.261	0.133
01Jan3000, 03:50	0.297	0.151
01Jan3000, 04:05	0.354	0.181
01Jan3000, 04:20	0.414	0.211
01Jan3000, 04:35	0.648	0.33
01Jan3000, 04:50	1.131	0.577
01Jan3000, 05:05	2.502	1.276
01Jan3000, 05:20	2.733	1.394
01Jan3000, 05:35	2.793	1.424
01Jan3000, 05:50	2.85	1.454
01Jan3000, 06:05	2.886	1.472
01Jan3000, 06:20	2.916	1.487
01Jan3000, 06:35	2.949	1.504
01Jan3000, 06:50	2.973	1.516
01Jan3000, 07:05	3	1.53

Shed Parameters - Pod 2

DEVELOPED CONDITIONS					
Drainage Shed	Area (ac)	Length (feet)	Elev dn	Elev up	Slope (%)
P2- 58	5.5961	990	2538.8	2546.1	0.737374
P2- 59	5.8944	1580	2523.56	2536.1	0.793671
P2- 60	7.2323	1070	2532.3	2540.8	0.794393
P2- 61	4.1073	1260	2562.1	2565.1	0.238095
P2- 62	7.7728	1270	2549.1	2559.9	0.850394
P2- 63	4.0089	890	2537.6	2546.7	1.022472
P2- 64	8.0819	1210	2528.2	2541	1.057851
P2- 65	1.1909	310	2539.1	2542	0.935484
P2- 66	8.9217	1360	2537.4	2547	0.705882
P2- 67	12.5906	1780	2534.7	2552.2	0.983146
P2- 68	4.2450	1950	2518.5	2532.5	0.717949
P2- 69	5.7293	1060	2526.7	2533.4	0.632075
P2- 70	12.8051	1360	2532	2549.3	1.272059
P2- 71	4.2878	710	2539.5	2547.5	1.126761
P2- 72	6.6392	1300	2531.5	2539.5	0.615385
P2- 73	6.4605	890	2529.5	2537	0.842697
P2- 74	5.8580	810	2550.8	2557.8	0.864198
P2- 75	3.7809	680	2547.4	2557.7	1.514706
P2- 76	6.9868	1230	2552.7	2565.1	1.00813
P2- 77	3.2460	980	2552.9	2565.1	1.244898
P2- 78	4.8944	970	2527.7	2565.1	3.85567
P2- 79	4.0711	760	2544.6	2551.7	0.934211
P2- 80	2.1558	480	2548.5	2552.9	0.916667
P2- 81	11.0348	1470	2538.6	2554.8	1.102041
P2- 82	5.1358	700	2547.1	2555.2	1.157143
P2- 83	7.7059	1790	2533.9	2555.7	1.217877
P2- 84	6.0027	830	2535.1	2548.1	1.566265
P2- 85	3.3268	740	2540.3	2548.5	1.108108
P2- 86	1.5261	460	2550.1	2554.1	0.869565
P2- 87	5.9921	1100	2541.4	2549.1	0.7
P2- 88	0.8086	920	2534.9	2539.9	0.543478
P2- 89	7.2895	470	2527.6	2532	0.93617
P2- 90	4.5258	590	2521.7	2529.8	1.372881
P2- 91	1.4885	400	2553.4	2555.5	0.525
P2- 92	5.2481	810	2532.5	2540.1	0.938272

Standard Form

Project	Drainage Basin Name	Drainage Area (Acres)	Drainage Area (Sq. Mi.)	701 602 Precipitation No.	Cover Type and Hydrologic Condition	Curve # for Hydrologic Soil Group	Designation	K (feet/cu)	Area (Acres)	Length (feet)	Slope (%)	T ₁ (Min)	Length (feet)	Slope (%)	V ₁ (FPS)	V ₂ (FPS)	T ₁ (Min)	Total Length (feet)	T ₂ (Min)	T ₃ (Min)	T ₄ (Min)	T ₅ (Min)	T ₆ (Min)	T ₇ (Min)	T ₈ (Min)	T ₉ (Min)	T ₁₀ (Min)	T ₁₁ (Min)	T ₁₂ (Min)	T ₁₃ (Min)	T ₁₄ (Min)	T ₁₅ (Min)	T ₁₆ (Min)	T ₁₇ (Min)	T ₁₈ (Min)	T ₁₉ (Min)	T ₂₀ (Min)	T ₂₁ (Min)	T ₂₂ (Min)	T ₂₃ (Min)	T ₂₄ (Min)	T ₂₅ (Min)	T ₂₆ (Min)	T ₂₇ (Min)	T ₂₈ (Min)	T ₂₉ (Min)	T ₃₀ (Min)	T ₃₁ (Min)	T ₃₂ (Min)	T ₃₃ (Min)	T ₃₄ (Min)	T ₃₅ (Min)	T ₃₆ (Min)	T ₃₇ (Min)	T ₃₈ (Min)	T ₃₉ (Min)	T ₄₀ (Min)	T ₄₁ (Min)	T ₄₂ (Min)	T ₄₃ (Min)	T ₄₄ (Min)	T ₄₅ (Min)	T ₄₆ (Min)	T ₄₇ (Min)	T ₄₈ (Min)	T ₄₉ (Min)	T ₅₀ (Min)	T ₅₁ (Min)	T ₅₂ (Min)	T ₅₃ (Min)	T ₅₄ (Min)	T ₅₅ (Min)	T ₅₆ (Min)	T ₅₇ (Min)	T ₅₈ (Min)	T ₅₉ (Min)	T ₆₀ (Min)	T ₆₁ (Min)	T ₆₂ (Min)	T ₆₃ (Min)	T ₆₄ (Min)	T ₆₅ (Min)	T ₆₆ (Min)	T ₆₇ (Min)	T ₆₈ (Min)	T ₆₉ (Min)	T ₇₀ (Min)	T ₇₁ (Min)	T ₇₂ (Min)	T ₇₃ (Min)	T ₇₄ (Min)	T ₇₅ (Min)	T ₇₆ (Min)	T ₇₇ (Min)	T ₇₈ (Min)	T ₇₉ (Min)	T ₈₀ (Min)	T ₈₁ (Min)	T ₈₂ (Min)	T ₈₃ (Min)	T ₈₄ (Min)	T ₈₅ (Min)	T ₈₆ (Min)	T ₈₇ (Min)	T ₈₈ (Min)	T ₈₉ (Min)	T ₉₀ (Min)	T ₉₁ (Min)	T ₉₂ (Min)	T ₉₃ (Min)	T ₉₄ (Min)	T ₉₅ (Min)	T ₉₆ (Min)	T ₉₇ (Min)	T ₉₈ (Min)	T ₉₉ (Min)	T ₁₀₀ (Min)	T ₁₀₁ (Min)	T ₁₀₂ (Min)	T ₁₀₃ (Min)	T ₁₀₄ (Min)	T ₁₀₅ (Min)	T ₁₀₆ (Min)	T ₁₀₇ (Min)	T ₁₀₈ (Min)	T ₁₀₉ (Min)	T ₁₁₀ (Min)	T ₁₁₁ (Min)	T ₁₁₂ (Min)	T ₁₁₃ (Min)	T ₁₁₄ (Min)	T ₁₁₅ (Min)	T ₁₁₆ (Min)	T ₁₁₇ (Min)	T ₁₁₈ (Min)	T ₁₁₉ (Min)	T ₁₂₀ (Min)	T ₁₂₁ (Min)	T ₁₂₂ (Min)	T ₁₂₃ (Min)	T ₁₂₄ (Min)	T ₁₂₅ (Min)	T ₁₂₆ (Min)	T ₁₂₇ (Min)	T ₁₂₈ (Min)	T ₁₂₉ (Min)	T ₁₃₀ (Min)	T ₁₃₁ (Min)	T ₁₃₂ (Min)	T ₁₃₃ (Min)	T ₁₃₄ (Min)	T ₁₃₅ (Min)	T ₁₃₆ (Min)	T ₁₃₇ (Min)	T ₁₃₈ (Min)	T ₁₃₉ (Min)	T ₁₄₀ (Min)	T ₁₄₁ (Min)	T ₁₄₂ (Min)	T ₁₄₃ (Min)	T ₁₄₄ (Min)	T ₁₄₅ (Min)	T ₁₄₆ (Min)	T ₁₄₇ (Min)	T ₁₄₈ (Min)	T ₁₄₉ (Min)	T ₁₅₀ (Min)	T ₁₅₁ (Min)	T ₁₅₂ (Min)	T ₁₅₃ (Min)	T ₁₅₄ (Min)	T ₁₅₅ (Min)	T ₁₅₆ (Min)	T ₁₅₇ (Min)	T ₁₅₈ (Min)	T ₁₅₉ (Min)	T ₁₆₀ (Min)	T ₁₆₁ (Min)	T ₁₆₂ (Min)	T ₁₆₃ (Min)	T ₁₆₄ (Min)	T ₁₆₅ (Min)	T ₁₆₆ (Min)	T ₁₆₇ (Min)	T ₁₆₈ (Min)	T ₁₆₉ (Min)	T ₁₇₀ (Min)	T ₁₇₁ (Min)	T ₁₇₂ (Min)	T ₁₇₃ (Min)	T ₁₇₄ (Min)	T ₁₇₅ (Min)	T ₁₇₆ (Min)	T ₁₇₇ (Min)	T ₁₇₈ (Min)	T ₁₇₉ (Min)	T ₁₈₀ (Min)	T ₁₈₁ (Min)	T ₁₈₂ (Min)	T ₁₈₃ (Min)	T ₁₈₄ (Min)	T ₁₈₅ (Min)	T ₁₈₆ (Min)	T ₁₈₇ (Min)	T ₁₈₈ (Min)	T ₁₈₉ (Min)	T ₁₉₀ (Min)	T ₁₉₁ (Min)	T ₁₉₂ (Min)	T ₁₉₃ (Min)	T ₁₉₄ (Min)	T ₁₉₅ (Min)	T ₁₉₆ (Min)	T ₁₉₇ (Min)	T ₁₉₈ (Min)	T ₁₉₉ (Min)	T ₂₀₀ (Min)	T ₂₀₁ (Min)	T ₂₀₂ (Min)	T ₂₀₃ (Min)	T ₂₀₄ (Min)	T ₂₀₅ (Min)	T ₂₀₆ (Min)	T ₂₀₇ (Min)	T ₂₀₈ (Min)	T ₂₀₉ (Min)	T ₂₁₀ (Min)	T ₂₁₁ (Min)	T ₂₁₂ (Min)	T ₂₁₃ (Min)	T ₂₁₄ (Min)	T ₂₁₅ (Min)	T ₂₁₆ (Min)	T ₂₁₇ (Min)	T ₂₁₈ (Min)	T ₂₁₉ (Min)	T ₂₂₀ (Min)	T ₂₂₁ (Min)	T ₂₂₂ (Min)	T ₂₂₃ (Min)	T ₂₂₄ (Min)	T ₂₂₅ (Min)	T ₂₂₆ (Min)	T ₂₂₇ (Min)	T ₂₂₈ (Min)	T ₂₂₉ (Min)	T ₂₃₀ (Min)	T ₂₃₁ (Min)	T ₂₃₂ (Min)	T ₂₃₃ (Min)	T ₂₃₄ (Min)	T ₂₃₅ (Min)	T ₂₃₆ (Min)	T ₂₃₇ (Min)	T ₂₃₈ (Min)	T ₂₃₉ (Min)	T ₂₄₀ (Min)	T ₂₄₁ (Min)	T ₂₄₂ (Min)	T ₂₄₃ (Min)	T ₂₄₄ (Min)	T ₂₄₅ (Min)	T ₂₄₆ (Min)	T ₂₄₇ (Min)	T ₂₄₈ (Min)	T ₂₄₉ (Min)	T ₂₅₀ (Min)	T ₂₅₁ (Min)	T ₂₅₂ (Min)	T ₂₅₃ (Min)	T ₂₅₄ (Min)	T ₂₅₅ (Min)	T ₂₅₆ (Min)	T ₂₅₇ (Min)	T ₂₅₈ (Min)	T ₂₅₉ (Min)	T ₂₆₀ (Min)	T ₂₆₁ (Min)	T ₂₆₂ (Min)	T ₂₆₃ (Min)	T ₂₆₄ (Min)	T ₂₆₅ (Min)	T ₂₆₆ (Min)	T ₂₆₇ (Min)	T ₂₆₈ (Min)	T ₂₆₉ (Min)	T ₂₇₀ (Min)	T ₂₇₁ (Min)	T ₂₇₂ (Min)	T ₂₇₃ (Min)	T ₂₇₄ (Min)	T ₂₇₅ (Min)	T ₂₇₆ (Min)	T ₂₇₇ (Min)	T ₂₇₈ (Min)	T ₂₇₉ (Min)	T ₂₈₀ (Min)	T ₂₈₁ (Min)	T ₂₈₂ (Min)	T ₂₈₃ (Min)	T ₂₈₄ (Min)	T ₂₈₅ (Min)	T ₂₈₆ (Min)	T ₂₈₇ (Min)	T ₂₈₈ (Min)	T ₂₈₉ (Min)	T ₂₉₀ (Min)	T ₂₉₁ (Min)	T ₂₉₂ (Min)	T ₂₉₃ (Min)	T ₂₉₄ (Min)	T ₂₉₅ (Min)	T ₂₉₆ (Min)	T ₂₉₇ (Min)	T ₂₉₈ (Min)	T ₂₉₉ (Min)	T ₃₀₀ (Min)	T ₃₀₁ (Min)	T ₃₀₂ (Min)	T ₃₀₃ (Min)	T ₃₀₄ (Min)	T ₃₀₅ (Min)	T ₃₀₆ (Min)	T ₃₀₇ (Min)	T ₃₀₈ (Min)	T ₃₀₉ (Min)	T ₃₁₀ (Min)	T ₃₁₁ (Min)	T ₃₁₂ (Min)	T ₃₁₃ (Min)	T ₃₁₄ (Min)	T ₃₁₅ (Min)	T ₃₁₆ (Min)	T ₃₁₇ (Min)	T ₃₁₈ (Min)	T ₃₁₉ (Min)	T ₃₂₀ (Min)	T ₃₂₁ (Min)	T ₃₂₂ (Min)	T ₃₂₃ (Min)	T ₃₂₄ (Min)	T ₃₂₅ (Min)	T ₃₂₆ (Min)	T ₃₂₇ (Min)	T ₃₂₈ (Min)	T ₃₂₉ (Min)	T ₃₃₀ (Min)	T ₃₃₁ (Min)	T ₃₃₂ (Min)	T ₃₃₃ (Min)	T ₃₃₄ (Min)	T ₃₃₅ (Min)	T ₃₃₆ (Min)	T ₃₃₇ (Min)	T ₃₃₈ (Min)	T ₃₃₉ (Min)	T ₃₄₀ (Min)	T ₃₄₁ (Min)	T ₃₄₂ (Min)	T ₃₄₃ (Min)	T ₃₄₄ (Min)	T ₃₄₅ (Min)	T ₃₄₆ (Min)	T ₃₄₇ (Min)	T ₃₄₈ (Min)	T ₃₄₉ (Min)	T ₃₅₀ (Min)	T ₃₅₁ (Min)	T ₃₅₂ (Min)	T ₃₅₃ (Min)	T ₃₅₄ (Min)	T ₃₅₅ (Min)	T ₃₅₆ (Min)	T ₃₅₇ (Min)	T ₃₅₈ (Min)	T ₃₅₉ (Min)	T ₃₆₀ (Min)	T ₃₆₁ (Min)	T ₃₆₂ (Min)	T ₃₆₃ (Min)	T ₃₆₄ (Min)	T ₃₆₅ (Min)	T ₃₆₆ (Min)	T ₃₆₇ (Min)	T ₃₆₈ (Min)	T ₃₆₉ (Min)	T ₃₇₀ (Min)	T ₃₇₁ (Min)	T ₃₇₂ (Min)	T ₃₇₃ (Min)	T ₃₇₄ (Min)	T ₃₇₅ (Min)	T ₃₇₆ (Min)	T ₃₇₇ (Min)	T ₃₇₈ (Min)	T ₃₇₉ (Min)	T ₃₈₀ (Min)	T ₃₈₁ (Min)	T ₃₈₂ (Min)	T ₃₈₃ (Min)	T ₃₈₄ (Min)	T ₃₈₅ (Min)	T ₃₈₆ (Min)	T ₃₈₇ (Min)	T ₃₈₈ (Min)	T ₃₈₉ (Min)	T ₃₉₀ (Min)	T ₃₉₁ (Min)	T ₃₉₂ (Min)	T ₃₉₃ (Min)	T ₃₉₄ (Min)	T ₃₉₅ (Min)	T ₃₉₆ (Min)	T ₃₉₇ (Min)	T ₃₉₈ (Min)	T ₃₉₉ (Min)	T ₄₀₀ (Min)	T ₄₀₁ (Min)	T ₄₀₂ (Min)	T ₄₀₃ (Min)	T ₄₀₄ (Min)	T ₄₀₅ (Min)	T ₄₀₆ (Min)	T ₄₀₇ (Min)	T ₄₀₈ (Min)	T ₄₀₉ (Min)	T ₄₁₀ (Min)	T ₄₁₁ (Min)	T ₄₁₂ (Min)	T ₄₁₃ (Min)	T ₄₁₄ (Min)	T ₄₁₅ (Min)	T ₄₁₆ (Min)	T ₄₁₇ (Min)	T ₄₁₈ (Min)	T ₄₁₉ (Min)	T ₄₂₀ (Min)	T ₄₂₁ (Min)	T ₄₂₂ (Min)	T ₄₂₃ (Min)	T ₄₂₄ (Min)	T ₄₂₅ (Min)	T ₄₂₆ (Min)	T ₄₂₇ (Min)	T ₄₂₈ (Min)	T ₄₂₉ (Min)	T ₄₃₀ (Min)	T ₄₃₁ (Min)	T ₄₃₂ (Min)	T ₄₃₃ (Min)	T ₄₃₄ (Min)	T ₄₃₅ (Min)	T ₄₃₆ (Min)	T ₄₃₇ (Min)	T ₄₃₈ (Min)	T ₄₃₉ (Min)	T ₄₄₀ (Min)	T ₄₄₁ (Min)	T ₄₄₂ (Min)	T ₄₄₃ (Min)	T ₄₄₄ (Min)	T ₄₄₅ (Min)	T ₄₄₆ (Min)	T ₄₄₇ (Min)	T ₄₄₈ (Min)	T ₄₄₉ (Min)	T ₄₅₀ (Min)	T ₄₅₁ (Min)	T ₄₅₂ (Min)	T ₄₅₃ (Min)	T ₄₅₄ (Min)	T ₄₅₅ (Min)	T ₄₅₆ (Min)	T ₄₅₇ (Min)	T ₄₅₈ (Min)	T ₄₅₉ (Min)	T ₄₆₀ (Min)	T ₄₆₁ (Min)	T ₄₆₂ (Min)	T ₄₆₃ (Min)	T ₄₆₄ (Min)	T ₄₆₅ (Min)	T ₄₆₆ (Min)	T ₄₆₇ (Min)	T ₄₆₈ (Min)	T ₄₆₉ (Min)	T ₄₇₀ (Min)	T ₄₇₁ (Min)	T ₄₇₂ (Min)	T ₄₇₃ (Min)	T ₄₇₄ (Min)	T ₄₇₅ (Min)	T ₄₇₆ (Min)	T ₄₇₇ (Min)	T ₄₇₈ (Min)	T ₄₇₉ (Min)	T ₄₈₀ (Min)	T ₄₈₁ (Min)	T ₄₈₂ (Min)	T ₄₈₃ (Min)	T ₄₈₄ (Min)	T ₄₈₅ (Min)	T ₄₈₆ (Min)	T ₄₈₇ (Min)	T ₄₈₈ (Min)	T ₄₈₉ (Min)	T ₄₉₀ (Min)	T ₄₉₁ (Min)	T ₄₉₂ (Min)	T ₄₉₃ (Min)	T ₄₉₄ (Min)	T ₄₉₅ (Min)	T ₄₉₆ (Min)	T ₄₉₇ (Min)	T ₄₉₈ (Min)	T ₄₉₉ (Min)	T ₅₀₀ (Min)	T ₅₀₁ (Min)	T ₅₀₂ (Min)	T ₅₀₃ (Min)	T ₅₀₄ (Min)	T ₅₀₅ (Min)	T ₅₀₆ (Min)	T ₅₀₇ (Min)	T ₅₀₈ (Min)	T ₅₀₉ (Min)	T ₅₁₀ (Min)	T ₅₁₁ (Min)	T ₅₁₂ (Min)	T ₅₁₃ (Min)	T ₅₁₄ (Min)	T ₅₁₅ (Min)	T ₅₁₆ (Min)	T ₅₁₇ (Min)	T ₅₁₈ (Min)	T ₅₁₉ (Min)	T ₅₂₀ (Min)	T ₅₂₁ (Min)	T ₅₂₂ (Min)	T ₅₂₃ (Min)	T ₅₂₄ (Min)	T ₅₂₅ (Min)	T ₅₂₆ (Min)	T ₅₂₇ (Min)	T ₅₂₈ (Min)	T ₅₂₉ (Min)	T ₅₃₀ (Min)	T ₅₃₁ (Min)	T ₅₃₂ (Min)	T ₅₃₃ (Min)	T ₅₃₄ (Min)	T ₅₃₅ (Min)	T ₅₃₆ (Min)	T ₅₃₇ (Min)	T ₅₃₈ (Min)	T ₅₃₉ (Min)	T ₅₄₀ (Min)	T ₅₄₁ (Min)	T ₅₄₂ (Min)	T ₅₄₃ (Min)	T ₅₄₄ (Min)	T ₅₄₅ (Min)	T ₅₄₆ (Min)	T ₅₄₇ (Min)	T ₅₄₈ (Min)	T ₅₄₉ (Min)	T ₅₅₀ (Min)	T ₅₅₁ (Min)	T ₅₅₂ (Min)	T ₅₅₃ (Min)	T ₅₅₄ (Min)	T ₅₅₅ (Min)	T ₅₅₆ (Min)	T ₅₅₇ (Min)	T ₅₅₈ (Min)	T ₅₅₉ (Min)	T ₅₆₀ (Min)	T ₅₆₁ (Min)	T ₅₆₂ (Min)	T ₅₆₃ (Min)	T ₅₆₄ (Min)	T ₅₆₅ (Min)	T ₅₆₆ (Min)	T ₅₆₇ (Min)	T ₅₆₈ (Min)	T ₅₆₉ (Min)	T ₅₇₀ (Min)	T ₅₇₁ (Min)	T ₅₇₂ (Min)	T ₅₇₃ (Min)	T ₅₇₄ (Min)	T ₅₇₅ (Min)	T ₅₇₆ (Min)	T ₅₇₇ (Min)	T ₅₇₈ (Min)	T ₅₇₉ (Min)	T ₅₈₀ (Min)	T ₅₈₁ (Min)	T ₅₈₂ (Min)	T ₅₈₃ (Min)	T ₅₈₄ (Min)	T ₅₈₅ (Min)	T ₅₈₆ (Min)	T ₅₈₇ (Min)	T ₅₈₈ (Min)	T ₅₈₉ (Min)	T ₅₉₀ (Min)	T ₅₉₁ (Min)	T ₅₉₂ (Min)	T ₅₉₃ (Min)	T ₅₉₄ (Min)	T ₅₉₅ (Min)	T ₅₉₆ (Min)	T ₅₉₇ (Min)	T ₅₉₈ (Min)	T ₅₉₉ (Min)	T ₆₀₀ (Min)	T ₆₀₁ (Min)	T ₆₀₂ (Min)	T ₆₀₃ (Min)	T ₆₀₄ (Min)	T ₆₀₅ (Min)	T ₆₀₆ (Min)	T ₆₀₇ (Min)	T ₆₀₈ (Min)	T ₆₀₉ (Min)	T ₆₁₀ (Min)	T ₆₁₁ (Min)	T ₆₁₂ (Min
---------	---------------------	-----------------------	-------------------------	---------------------------	-------------------------------------	-----------------------------------	-------------	-------------	--------------	---------------	-----------	----------------------	---------------	-----------	----------------------	----------------------	----------------------	---------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	------------------------	-----------------------

StandardForm

Notes	URBAN AREAS	K = 0.0132 C _h - 0.39				N = 1.87 (1 + 4.97 V ₁ ^{1/2}) / (S ₁ ^{1/3})				Generalized Manning's Equations	
		Existing Conditions				Developed Conditions				Existing Conditions	Developed Conditions
	1.01 Open space - poor	58	79	86	89					V ₁ = 14.8' (S ₁ ^{1/3}) ^{0.5}	V ₁ = 20.2' (S ₁ ^{1/3}) ^{0.5}
	1.02 Open space - fair	48	69	79	84					V ₂ = 28.4' (S ₁ ^{1/3}) ^{0.5}	V ₂ = 30.8' (S ₁ ^{1/3}) ^{0.5}
	1.03 Open space/parks - good	39	61	74	80						
	1.04 Paved (excludes right-of-way)	98	98	98	98						
	1.05 Paved: curbs and storm drains	98	98	98	98						
	1.06 Paved: open ditches (includes RW)	83	89	92	93						
	1.07 Gravel (includes RW)	78	85	89	91						
	1.08 Ditch (includes RW)	72	82	87	89						
	1.11 Commercial & Business	89	92	94	95						
	1.12 Industrial	81	89	91	93						
	1.13 Apartments/Condos	81	89	91	93						
	1.14 Townhouses <= 8000 sq. ft.	80	87	90	92						
	1.15 7000 sq. ft. lots	76	84	89	91						
	1.16 8000 sq. ft. lots	73	82	88	90						
	1.17 10,000 sq. ft. lots	61	75	83	87						
	1.18 14,000 sq. ft. lots	57	72	81	86						
	1.19 20,000 sq. ft. lots	54	70	80	85						
	1.20 40,000 sq. ft. lots	51	68	79	84						
	1.21 80,000 sq. ft. lots	48	65	77	82						

Routing

Kinematic Routing

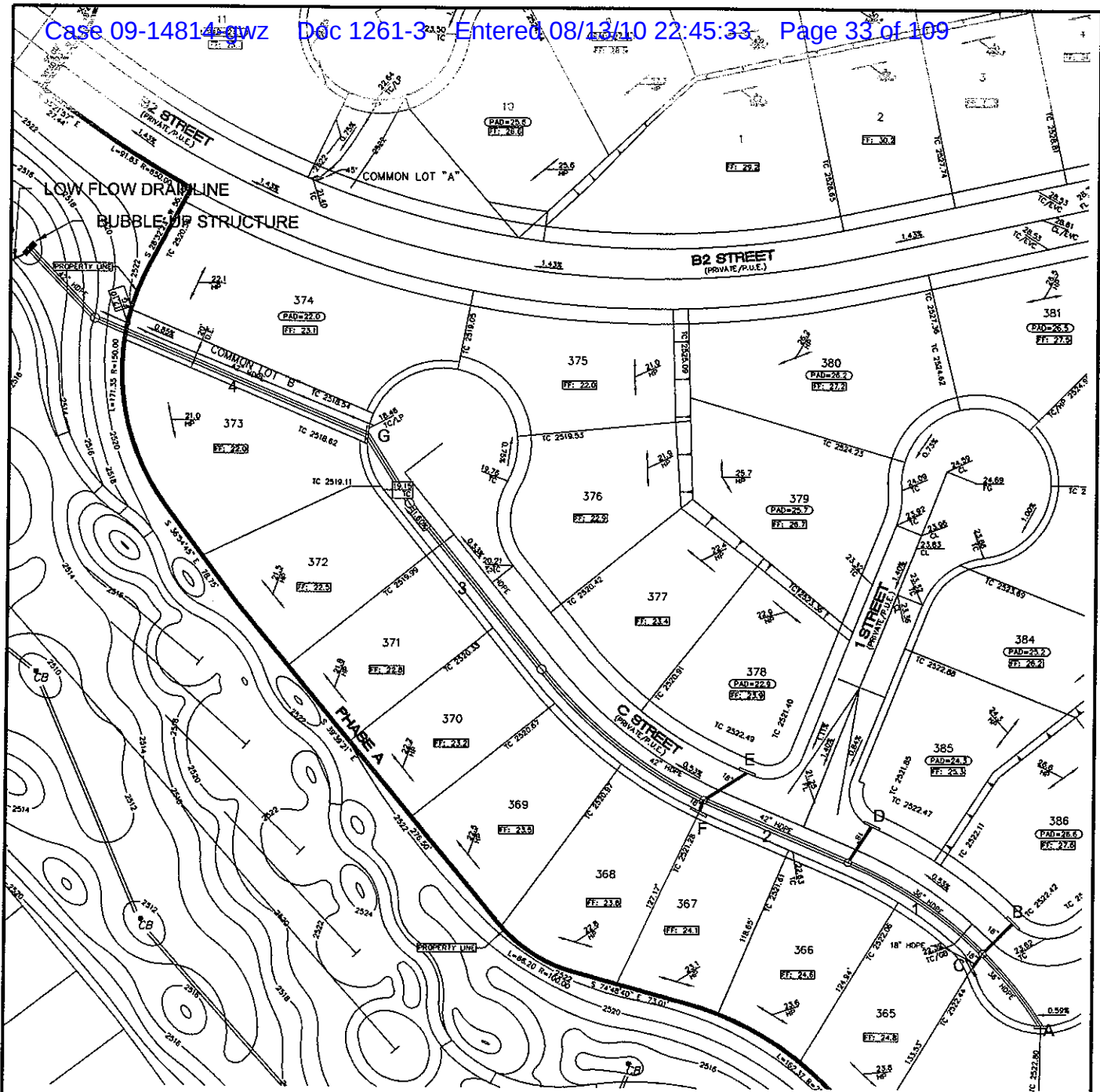
Reach	Length (ft)	slope	Manning "n"	Sub reaches	Shape	Width	Side Slope (xH:V)
R-JN10	1134	0.011	0.016	5	Trapezoid	60	0.5
R-JN11	260	0.006	0.016	5	Trapezoid	60	0.5
R-JN12	270	0.007	0.016	5	Trapezoid	60	0.5
R-JN13	180	0.006	0.016	5	Trapezoid	60	0.5
R-JN14	200	0.01	0.016	5	Trapezoid	60	0.5
R-JN18	1016	0.011	0.016	5	Trapezoid	60	0.5
R-JN19	490	0.005	0.016	5	Trapezoid	60	0.5
R-JN21	140	0.017	0.016	5	Trapezoid	60	0.5
R-JN22	130	0.0114	0.016	5	Trapezoid	60	0.5
R-JN26	490	0.005	0.016	5	Trapezoid	60	0.5
R-JN31	480	0.0079	0.016	5	Trapezoid	60	0.5
R-JN32	640	0.005	0.016	5	Trapezoid	60	0.5
R-JN6	1084	0.011	0.016	5	Trapezoid	60	0.5
R-JN7	1590	0.009	0.016	5	Trapezoid	60	0.5
R-JN8	137	0.014	0.016	5	Trapezoid	60	0.5
R-JS17	725	0.008	0.016	5	Trapezoid	60	0.5
R-JS18	1480	0.006	0.016	5	Trapezoid	60	0.5
R-JS19	1480	0.006	0.016	5	Trapezoid	60	0.5
R-JS21	230	0.005	0.016	5	Trapezoid	60	0.5
R-P260	730	0.015	0.016	5	Trapezoid	60	0.5
R-P261	1310	0.01	0.016	5	Trapezoid	60	0.5
R-P265	1238	0.007	0.016	5	Trapezoid	60	0.5
R-P279	811	0.005	0.016	5	Trapezoid	60	0.5
R-P282	915	0.008	0.016	5	Trapezoid	60	0.5
R-P285	850	0.008	0.016	5	Trapezoid	60	0.5
R-P286	900	0.008	0.016	5	Trapezoid	60	0.5
R-P291	590	0.01	0.016	5	Trapezoid	60	0.5

GOLDEN VALLEY RANCH

APPENDIX B

DRAINAGE INFRASTRUCTURE CALCULATIONS

- COMMON LOT B (J-N23)
- COMMON LOT R (J-N30)
- COMMON LOT H (J-N15)
- COMMON LOT L (J-S20)
- COMMON LOT O (P2-67)



STORM DRAIN SYSTEM

INLET	SIZE	Q _{inlet}	Q _{intercept}	Q _{bypass}	Grade/Sump
A	8.5	48	12	36	G
B	11.5	47	17	30	G
C	11.5	36	15	21	G
D	11.5	27	12	15	G
E	11.5	22	11	11	G
F	8.5	21	8	13	G
G	11.5	36	11	25	S

SD PIPES

PIPE	Q _{pipe}	Size
1	44	A
2	56	B
3	75	C
4	86	48

BUBBLE-UP STR

PIPE Type	Open Area
48 Type 8	10 x 3.5

REVISIONS	OWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RJM				
CHECKED				
APPROVED				
APPROVED				
DATE 3/02/06				



RHODES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 2 - PHASE A

COMMON LOT B
NODE J-N23

SCALE 1" = 100'

NO.	REV.
A	0

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET A

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0059
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	44.000
T	Width of Spread (ft)	32.77

Gutter Flow

Eo	Gutter Flow Ratio	0.131
d	Depth of Flow (ft)	0.75
V	Average Velocity (ft/sec)	4.07

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	49.95	4.25	0.05	2.148	41.852
Parallel Bar P-1-7/8	1.50	2.88	0.23	9.580	32.271
Combination			0.27	11.729	32.271

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET B

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0053
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	43.000
T	Width of Spread (ft)	33.15

Gutter Flow

Eo	Gutter Flow Ratio	0.129
d	Depth of Flow (ft)	0.76
V	Average Velocity (ft/sec)	3.89

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	48.09	5.75	0.05	2.180	40.820
Parallel Bar P-1-7/8	1.50	4.38	0.36	14.644	26.176
Combination			0.39	16.824	26.176

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET C

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0053
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	36.000
T	Width of Spread (ft)	31.00

Gutter Flow

Eo	Gutter Flow Ratio	0.138
d	Depth of Flow (ft)	0.71
V	Average Velocity (ft/sec)	3.72

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	43.62	5.75	0.06	2.009	33.991
Parallel Bar P-1-7/8	1.50	4.38	0.38	12.916	21.075
Combination			0.41	14.925	21.075

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET D

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0053
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	27.000
T	Width of Spread (ft)	27.80

Gutter Flow

Eo	Gutter Flow Ratio	0.155
d	Depth of Flow (ft)	0.65
V	Average Velocity (ft/sec)	3.46

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	37.19	5.75	0.07	1.764	25.236
Parallel Bar P-1-7/8	1.50	4.38	0.42	10.501	14.736
Combination			0.45	12.264	14.736

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET E

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0053
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	22.000
T	Width of Spread (ft)	25.73

Gutter Flow

Eo	Gutter Flow Ratio	0.168
d	Depth of Flow (ft)	0.61
V	Average Velocity (ft/sec)	3.29

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	33.16	5.75	0.07	1.609	20.391
Parallel Bar P-1-7/8	1.50	4.38	0.44	9.034	11.357
Combination			0.48	10.643	11.357

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT B
NODE J-N23
INLET F

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0053
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	21.000
T	Width of Spread (ft)	25.28

Gutter Flow

Eo	Gutter Flow Ratio	0.172
d	Depth of Flow (ft)	0.60
V	Average Velocity (ft/sec)	3.25

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	32.30	4.25	0.08	1.576	19.424
Parallel Bar P-1-7/8	1.50	2.88	0.31	5.974	13.450
Combination			0.36	7.550	13.450

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjm

Project Description

SAG INLETS - ALL PODS

MODIFIED "C" L-11.5

Node J-N23 INLET 4

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	5.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.48
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	4.38
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.526
d_curb	Depth at Curb (ft)	0.671
Qi	Intercepted Flow (cfs)	11.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet

Worksheet for Triangular Channel

Project Description

Worksheet	COMMON LOT B - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	25.00 cfs

Results

Depth	0.61 ft
Flow Area	10.6 ft ²
Wetted Perimeter	34.89 ft
Top Width	34.87 ft
Critical Depth	0.54 ft
Critical Slope	0.009014 ft/ft
Velocity	2.37 ft/s
Velocity Head	0.09 ft
Specific Energy	0.69 ft
Froude Number	0.76
Flow Type	Subcritical

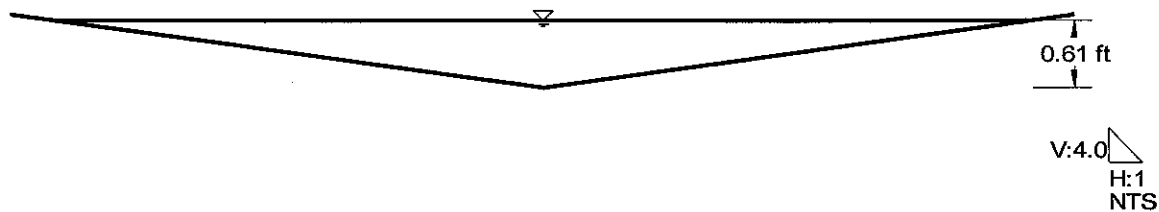
VELOCITY x DEPTH

2.4 x 0.6 = 1.4 < 0.6.

Cross Section**Cross Section for Triangular Channel**

Project Description	
Worksheet	COMMON LOT B - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.61 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	25.00 cfs



Q:\18449\dwg\design\SD_PRO\POD2\POD2_C_str.dwg, 3/16/2006 5:55:07 PM, \\vg-ps1\hp5100-eng, 1:1

STANLEY CONSULTANTS

CADD AT-R3

REVISIONS	DWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RN				
CHECKED				
APPROVED				
APPROVED				
DATE DATE				



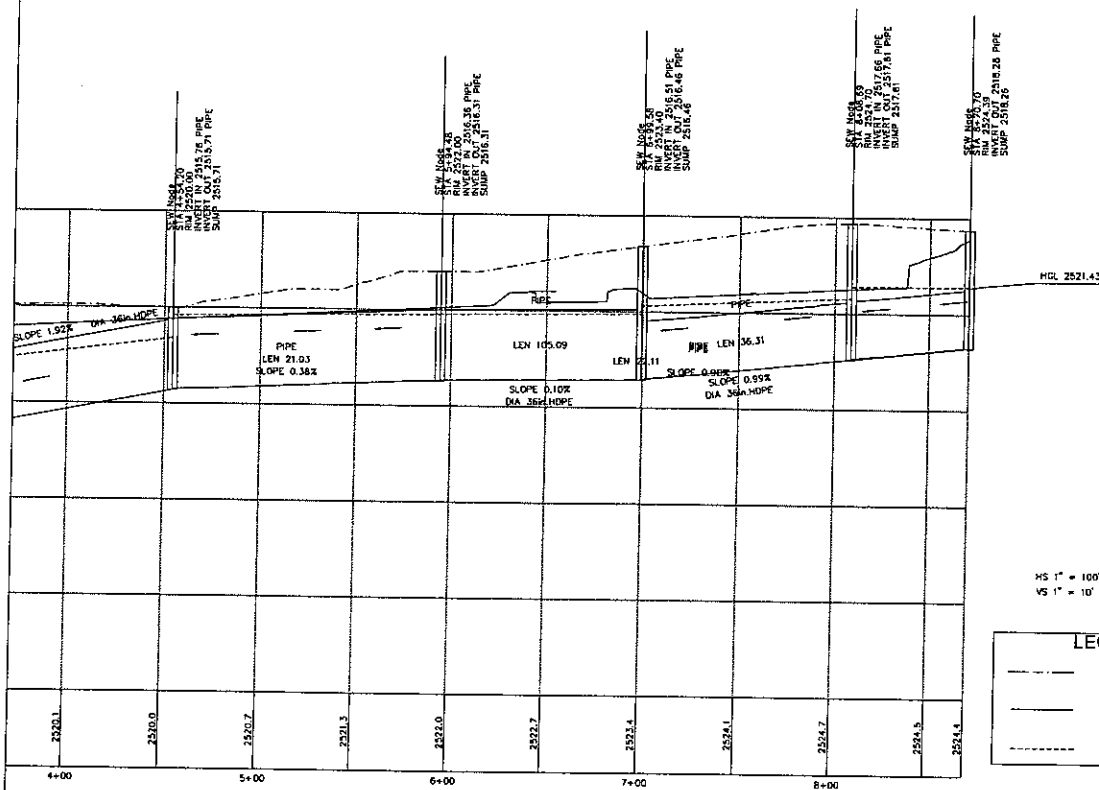
Stanley Consultants INC.

RHODES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 2 - PHASE A

COMMON LOT B
NODE J-N23

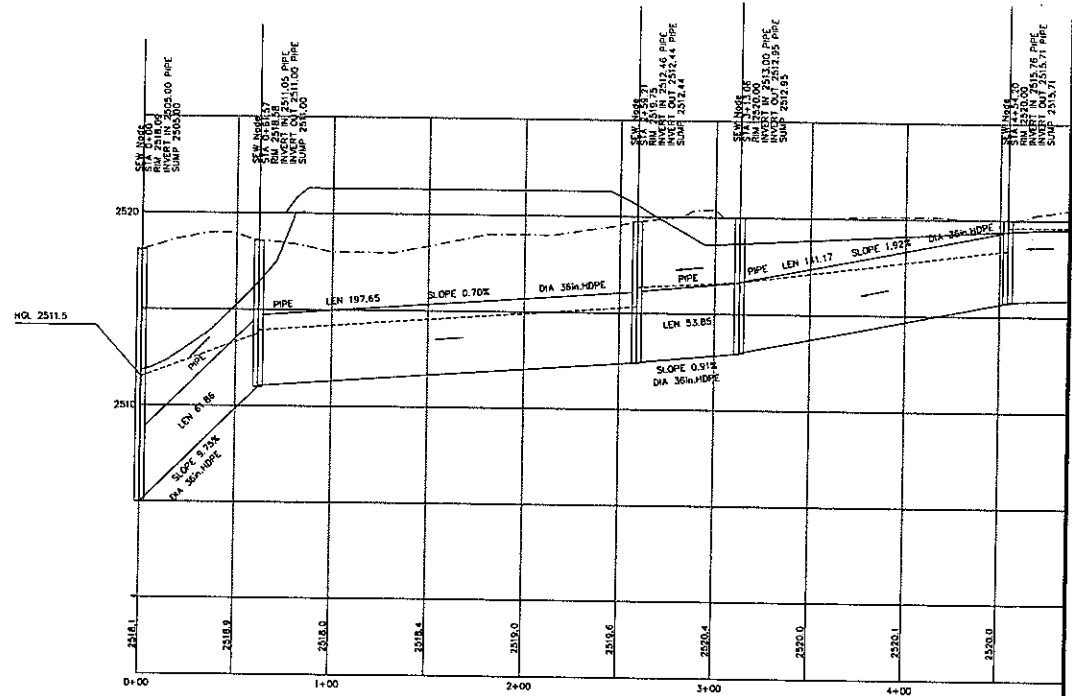
SCALE 1:1

NO.	REV.
A	0



HS 1" = 100'
VS 1" = 10'

LEGEND	
---	Existing Grade
---	Finish Grade
---	HGL



F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

STORM DRAIN AT POD2 C STR J-N23.DAT

ST-RH036507

DATE: 3/15/2006
TIME: 14: 9

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	36	4			3.00														
CD	42	4			3.50														
CD	54	4			4.50														
CD	12	4			1.00														
CD	48	4			4.00														
CD	30	4			2.50														
CD	27	4			2.25														
CD	24	4			2.00														
CD	18	4			1.50														
CD	21	4			1.75														

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV											
			100.00	2505.00	42	2511.50											
ELEMENT NO	2 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS								ANGLE	ANG PT	MAN H
			159.00	2511.00	42	0.013	0.00								0.00	0.00	0
ELEMENT NO	3 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
			164.00	2511.05	42	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00			
ELEMENT NO	4 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS								ANGLE	ANG PT	MAN H
			357.00	2512.44	42	0.013	0.00								0.00	0.00	0
ELEMENT NO	5 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
			362.00	2512.46	42	18	0	0.013	11.0	0.0	2512.46	0.00	90.00	0.00			
ELEMENT NO	6 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS								ANGLE	ANG PT	MAN H
			411.00	2512.95	42	0.013	0.00								0.00	0.00	0
ELEMENT NO	7 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
			416.00	2513.00	42	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00			
ELEMENT NO	8 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS								ANGLE	ANG PT	MAN H
			687.00	2515.71	42	0.013	320.00								0.00	0.00	0
ELEMENT NO	9 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
			692.00	2515.76	42	18	18	0.013	11.0	8.0	2515.76	2515.76	45.00	90.00			

P 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A REACH
 U/S DATA STATION INVERT SECT N
 747.00 2516.31 42 0.013
 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 11 IS A JUNCTION
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 752.00 2516.36 42 0 0 0.013 0.0 0.0 0.00 0.00 0.00 0.00
 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 12 IS A REACH
 U/S DATA STATION INVERT SECT N
 792.00 2516.46 42 0.013
 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 13 IS A JUNCTION
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 797.00 2516.51 42 18 0 0.013 12.0 0.0 2516.51 0.00 90.00 0.00
 WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 14 IS A REACH
 U/S DATA STATION INVERT SECT N
 907.00 2517.61 36 0.013
 RADIUS ANGLE ANG PT MAN H
 288.00 0.00 0.00 0

ELEMENT NO 15 IS A JUNCTION
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 912.00 2517.66 36 18 18 0.013 15.0 17.0 2517.66 2517.66 90.00 45.00
 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 16 IS A REACH
 U/S DATA STATION INVERT SECT N
 974.00 2518.28 36 0.013
 RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 17 IS A SYSTEM HEADWORKS
 U/S DATA STATION INVERT SECT
 974.00 2518.28 36
 W S ELEV
 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

MAIN STORM DRAIN FILE J-N23.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SP AVE	HF			NORM DEPTH		ZR		
100.00	2505.00	6.500	2511.500	86.0	8.94	1.241	2512.741	0.00	2.887	3.50	0.00	0.00	0	0.00
14.20	0.10169					.007307	0.10			1.237		0.00		
114.20	2506.44	5.162	2511.606	86.0	8.94	1.241	2512.847	0.00	2.887	3.50	0.00	0.00	0	0.00
HYDRAULIC JUMP														0.00
114.20	2506.44	1.594	2508.038	86.0	20.16	6.314	2514.352	0.00	2.887	3.50	0.00	0.00	0	0.00
4.86	0.10169					.038895	0.19			1.237		0.00		
119.06	2506.94	1.628	2508.567	86.0	19.60	5.967	2514.534	0.00	2.887	3.50	0.00	0.00	0	0.00
7.22	0.10169					.035159	0.25			1.237		0.00		
126.28	2507.67	1.690	2509.363	86.0	18.69	5.425	2514.788	0.00	2.887	3.50	0.00	0.00	0	0.00
6.07	0.10169					.030947	0.19			1.237		0.00		
132.35	2508.29	1.754	2510.044	86.0	17.82	4.931	2514.975	0.00	2.887	3.50	0.00	0.00	0	0.00
5.12	0.10169					.027252	0.14			1.237		0.00		
137.47	2508.81	1.821	2510.632	86.0	16.99	4.484	2515.116	0.00	2.887	3.50	0.00	0.00	0	0.00
4.33	0.10169					.024020	0.10			1.237		0.00		
141.80	2509.25	1.892	2511.143	86.0	16.20	4.076	2515.219	0.00	2.887	3.50	0.00	0.00	0	0.00
3.69	0.10169					.021191	0.08			1.237		0.00		
145.49	2509.63	1.966	2511.592	86.0	15.45	3.704	2515.296	0.00	2.887	3.50	0.00	0.00	0	0.00
3.10	0.10169					.018715	0.06			1.237		0.00		
148.59	2509.94	2.045	2511.987	86.0	14.73	3.368	2515.355	0.00	2.887	3.50	0.00	0.00	0	0.00
2.63	0.10169					.016550	0.04			1.237		0.00		
151.22	2510.21	2.128	2512.336	86.0	14.04	3.062	2515.398	0.00	2.887	3.50	0.00	0.00	0	0.00
2.18	0.10169					.014656	0.03			1.237		0.00		

ST-RH036511

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

MAIN STORM DRAIN FILE J-N23.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
153.40	2510.43	2.216	2512.647	86.0	13.39	2.784	2515.431	0.00	2.887	3.50	0.00	0.00	0	0.00
1.80	0.10169					.013001	0.02			1.237		0.00		
155.20	2510.61	2.310	2512.923	86.0	12.77	2.530	2515.453	0.00	2.887	3.50	0.00	0.00	0	0.00
1.44	0.10169					.011557	0.02			1.237		0.00		
156.64	2510.76	2.410	2513.170	86.0	12.17	2.301	2515.471	0.00	2.887	3.50	0.00	0.00	0	0.00
1.11	0.10169					.010299	0.01			1.237		0.00		
157.75	2510.87	2.518	2513.390	86.0	11.61	2.092	2515.482	0.00	2.887	3.50	0.00	0.00	0	0.00
0.79	0.10169					.009209	0.01			1.237		0.00		
158.54	2510.95	2.635	2513.588	86.0	11.07	1.901	2515.489	0.00	2.887	3.50	0.00	0.00	0	0.00
0.46	0.10169					.008275	0.00			1.237		0.00		
159.00	2511.00	2.765	2513.765	86.0	10.55	1.729	2515.494	0.00	2.887	3.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.007535	0.04					0.00		
164.00	2511.05	2.887	2513.937	86.0	10.13	1.594	2515.531	0.00	2.887	3.50	0.00	0.00	0	0.00
1.32	0.00720					.007215	0.01			2.891		0.00		
165.32	2511.06	2.891	2513.951	86.0	10.12	1.590	2515.541	0.00	2.887	3.50	0.00	0.00	0	0.00
191.68	0.00720					.007204	1.38			2.891		0.00		
357.00	2512.44	2.891	2515.331	86.0	10.12	1.590	2516.921	0.00	2.887	3.50	0.00	0.00	0	0.00
JUNCT STR	0.00400					.006382	0.03					0.00		
362.00	2512.46	3.882	2516.342	75.0	7.80	0.944	2517.286	0.00	2.711	3.50	0.00	0.00	0	0.00
49.00	0.01000					.005557	0.27			2.251		0.00		
411.00	2512.95	3.664	2516.614	75.0	7.80	0.944	2517.558	0.00	2.711	3.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.005557	0.03					0.00		

ST-RH036512

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 3

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

MAIN STORM DRAIN FILE J-N23.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
416.00	2513.00	3.642	2516.642	75.0	7.80	0.944	2517.586	0.00	2.711	3.50	0.00	0.00	0	0.00
31.88	0.01000					.005517	0.18			2.251		0.00		
447.88	2513.32	3.500	2516.819	75.0	7.80	0.944	2517.763	0.00	2.711	3.50	0.00	0.00	0	0.00
42.80	0.01000					.005151	0.22			2.251		0.00		
490.68	2513.75	3.217	2516.964	75.0	8.10	1.020	2517.984	0.00	2.711	3.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00	
490.68	2513.75	2.270	2516.017	75.0	11.36	2.003	2518.020	0.00	2.711	3.50	0.00	0.00	0	0.00
37.04	0.01000					.009768	0.36			2.251		0.00		
527.72	2514.12	2.270	2516.387	75.0	11.35	2.002	2518.389	0.00	2.711	3.50	0.00	0.00	0	0.00
107.66	0.01000					.009220	0.99			2.251		0.00		
635.38	2515.19	2.368	2517.562	75.0	10.82	1.819	2519.381	0.00	2.711	3.50	0.00	0.00	0	0.00
34.27	0.01000					.008208	0.28			2.251		0.00		
669.65	2515.54	2.472	2518.008	75.0	10.32	1.654	2519.662	0.00	2.711	3.50	0.00	0.00	0	0.00
13.62	0.01000					.007329	0.10			2.251		0.00		
683.27	2515.67	2.586	2518.259	75.0	9.84	1.504	2519.763	0.00	2.711	3.50	0.00	0.00	0	0.00
3.73	0.01000					.006570	0.02			2.251		0.00		
687.00	2515.71	2.711	2518.421	75.0	9.38	1.366	2519.787	0.00	2.711	3.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.004658	0.02					0.00		
692.00	2515.76	3.844	2519.604	56.0	5.82	0.526	2520.130	0.00	2.343	3.50	0.00	0.00	0	0.00
49.91	0.01000					.003076	0.15			1.865		0.00		
741.91	2516.26	3.500	2519.759	56.0	5.82	0.526	2520.285	0.00	2.343	3.50	0.00	0.00	0	0.00
5.09	0.01000					.002948	0.02			1.865		0.00		

ST-RH036513

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 4

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

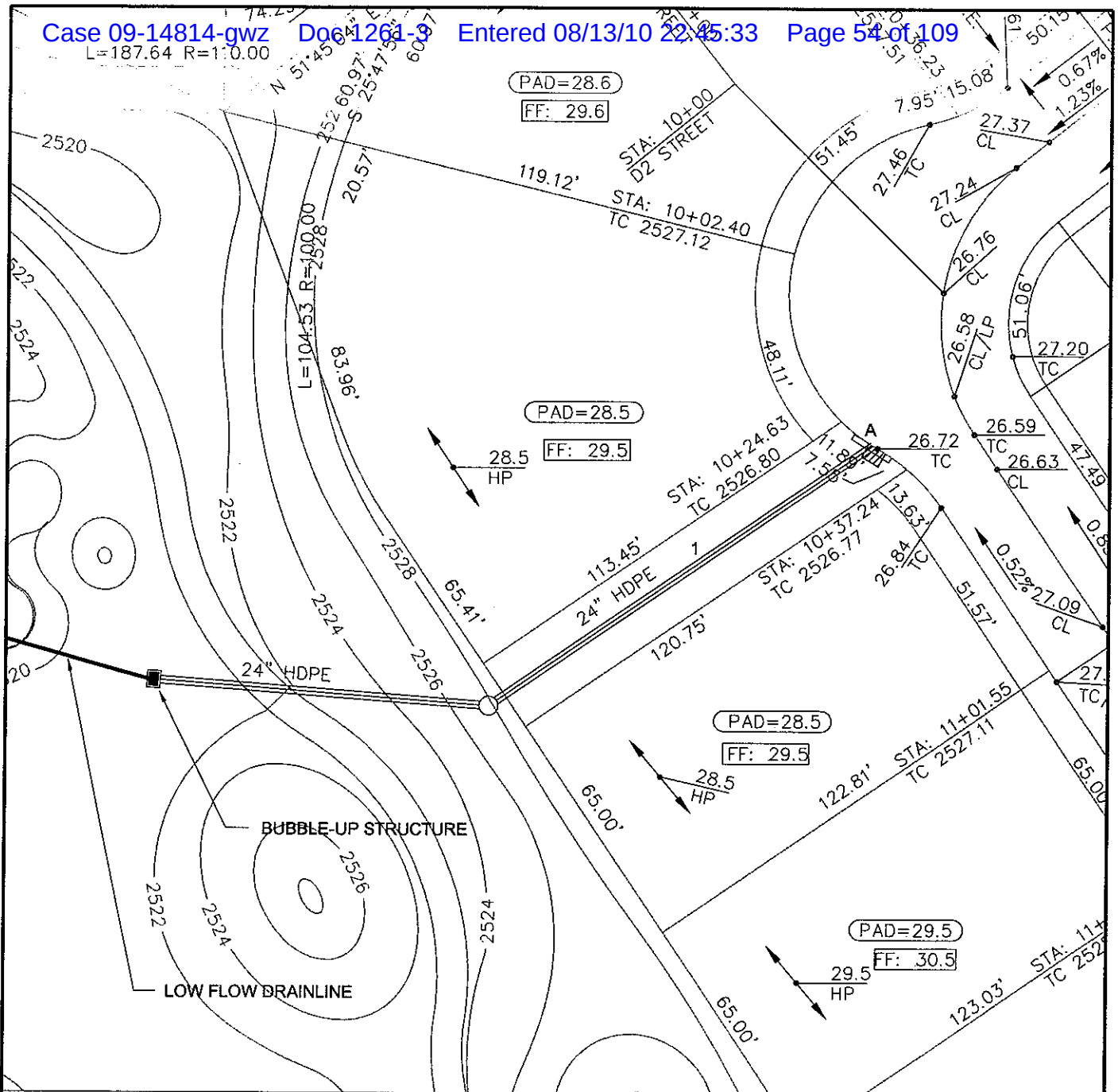
MAIN STORM DRAIN FILE J-N23.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HP			NORM DEPTH		ZR		
747.00	2516.31	3.461	2519.771	56.0	5.83	0.528	2520.299	0.00	2.343	3.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.002801	0.01					0.00		
752.00	2516.36	3.421	2519.781	56.0	5.85	0.532	2520.313	0.00	2.343	3.50	0.00	0.00	0	0.00
40.00	0.00250					.002770	0.11			3.500		0.00		
792.00	2516.46	3.434	2519.894	56.0	5.85	0.531	2520.425	0.00	2.343	3.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.002347	0.01					0.00		
797.00	2516.51	3.804	2520.314	44.0	6.22	0.602	2520.916	0.00	2.161	3.00	0.00	0.00	0	0.00
110.00	0.01000					.004352	0.48			1.780		0.00		
907.00	2517.61	3.182	2520.792	44.0	6.22	0.602	2521.394	0.00	2.161	3.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.002338	0.01					0.00		
912.00	2517.66	3.750	2521.410	12.0	1.70	0.045	2521.455	0.00	1.100	3.00	0.00	0.00	0	0.00
62.00	0.01000					.000324	0.02			0.860		0.00		
974.00	2518.28	3.150	2521.430	12.0	1.70	0.045	2521.475	0.00	1.100	3.00	0.00	0.00	0	0.00

ST-RH036514

NOTES
1. GLOSSARY
I = INVERT ELEVATION

C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY



STORM DRAIN SYSTEM						SD PIPES			BUBBLE-UP STR	
INLET	SIZE	Qinlet	Qintercept	Qbypass	Grade/Sump	PIPE	Qpipe	Size	PIPE Type	Open Area
A	17.5	40	15	25	S	1	15	A	24 Type F	2.5 x 3.5

DESIGNED	RJM
DRAWN	RJM
CHECKED	
APPROVED	
APPROVED	
DATE	3/02/06



RHOSES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 2 - PHASE A

COMMON LOT R
NODE J-N30

SCALE 1" = 40'
NO. A
REV. 0

STANLEY CONSULTANTS
CADD A1-R3

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjm

Project Description

SAG INLETS - ALL PODS

MODIFIED "C" L-17.5

Node J-N30

INLET A

Common Lot "R"

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	8.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.00
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	7.38
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.521
d_curb	Depth at Curb (ft)	0.667
Qi	Intercepted Flow (cfs)	15.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet

Worksheet for Triangular Channel

Project Description

Worksheet	COMMON LOT R - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	25.00 cfs

Results

Depth	0.61 ft
Flow Area	10.6 ft ²
Wetted Perimeter	34.89 ft
Top Width	34.87 ft
Critical Depth	0.54 ft
Critical Slope	0.009014 ft/ft
Velocity	2.37 ft/s
Velocity Head	0.09 ft
Specific Energy	0.69 ft
Froude Number	0.76
Flow Type	Subcritical

VELOCITY x DEPTH =

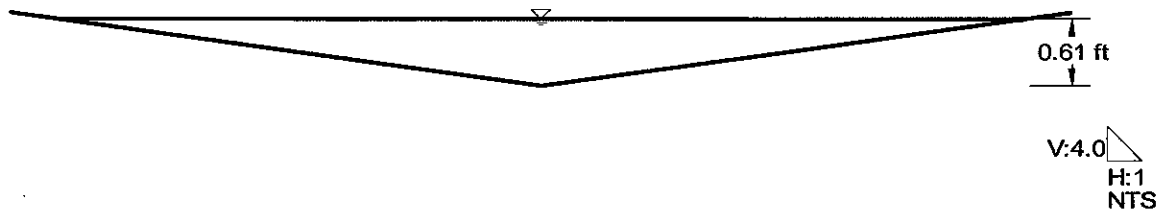
$$2.4 \times 0.6 = 1.4 < 6.0$$

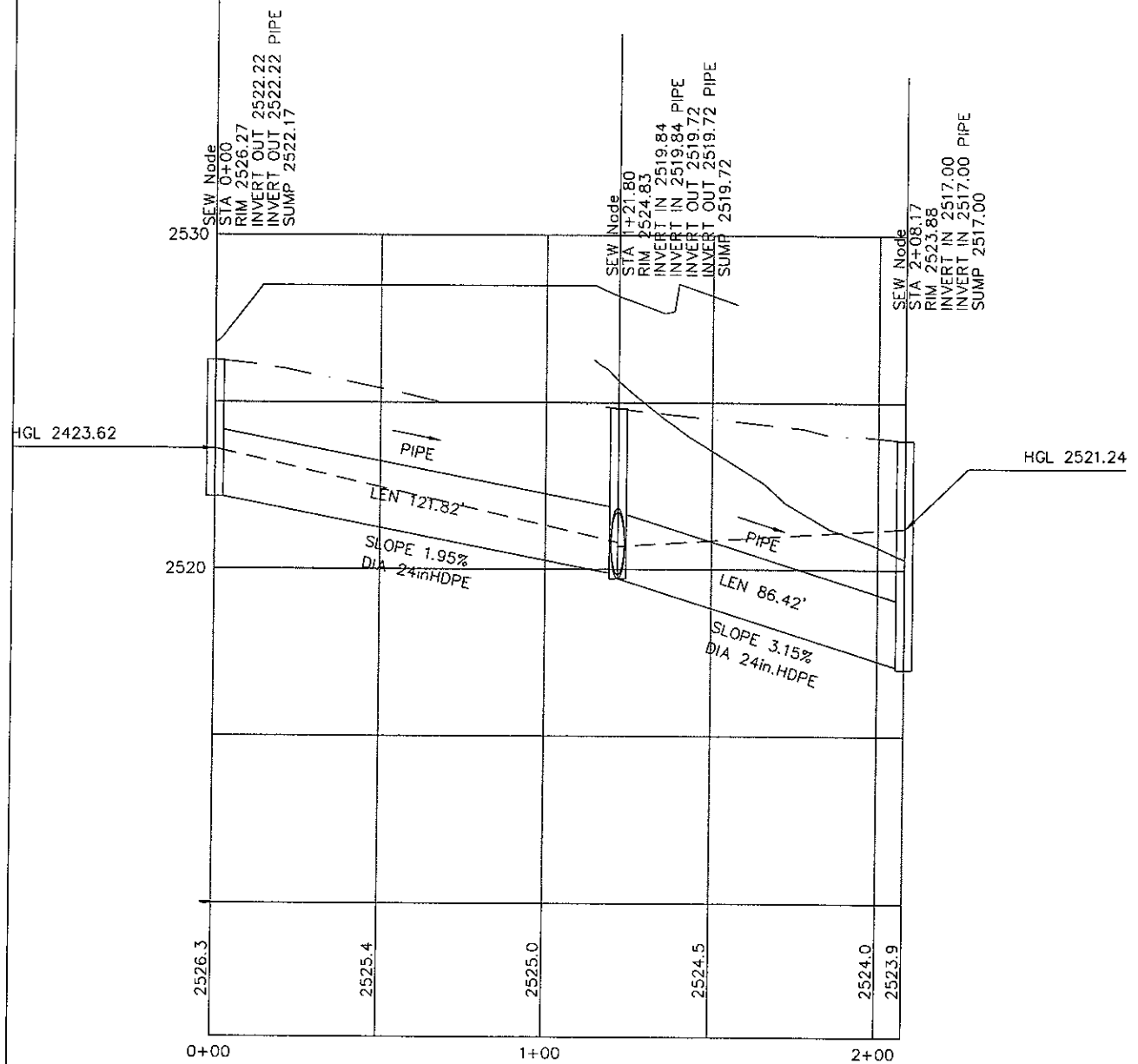
Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	COMMON LOT R - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.61 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	25.00 cfs






LEGEND

HS 1" = 50'
VS 1" = 5'

———— Existing Grade
———— Finish Grade
----- HGL

 Stanley Consultants INC.				
REVISIONS	DWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RN				
CHECKED				
APPROVED				
APPROVED				
DATE DATE				
RHODES HOMES ARIZONA GOLDEN VALLEY RANCH AREA 2 - PHASE A			COMMON LOT R NODE J-N30	
SCALE				
NO.			REV.	
A			0	

Q:\18449\dwg\design\SD_PRO\POD2\POD2_D1_D2.dwg, 3/16/2006 5:56:10 PM, \\wg-ps1\hp5100-eng, 1:1

\$\$\$\$\$FILENAME\$\$\$\$\$

CADD A1-R3 © STANLEY CONSULTANTS

ST-RH036521

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

STORM DRAIN IN POD 2 ON D2 STREET FOR 19 CFS J-N30

ST-RH036522

DATE: 3/14/2006
TIME: 9:19

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	24	4			2.00														

ST-RH036523

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY

STORM DRAIN IN POD 2 ON D2 STREET FOR 19 CFS J-N30

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVEPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR	
100.00	2517.00	4.240	2521.240	15.0	4.77	0.354	2521.594	0.00	1.396	2.00	0.00	0.00	0	0.00
76.76	0.03358					.004354	0.33			0.830			0.00	
176.76	2519.58	2.000	2521.577	15.0	4.77	0.354	2521.931	0.00	1.396	2.00	0.00	0.00	0	0.00
0.46	0.03358					.004354	0.00			0.830			0.00	
177.22	2519.59	2.000	2521.593	15.0	4.77	0.354	2521.947	0.00	1.396	2.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00	
177.22	2519.59	0.954	2520.547	15.0	10.14	1.597	2522.144	0.00	1.396	2.00	0.00	0.00	0	0.00
3.78	0.03358					.020151	0.08			0.830			0.00	
181.00	2519.72	0.968	2520.688	15.0	9.95	1.538	2522.226	0.00	1.396	2.00	0.00	0.00	0	0.00
JUNCT STR 0.02400													0.00	
186.00	2519.84	0.976	2520.816	15.0	9.85	1.506	2522.322	0.00	1.396	2.00	0.00	0.00	0	0.00
1.34	0.01951					.019085	0.03			0.970			0.00	
187.34	2519.87	0.976	2520.842	15.0	9.84	1.504	2522.346	0.00	1.396	2.00	0.00	0.00	0	0.00
63.24	0.01951					.017930	1.13			0.970			0.00	
250.58	2521.10	1.013	2522.113	15.0	9.39	1.268	2523.481	0.00	1.396	2.00	0.00	0.00	0	0.00
22.98	0.01951					.015793	0.36			0.970			0.00	
273.56	2521.55	1.052	2522.600	15.0	8.95	1.244	2523.844	0.00	1.396	2.00	0.00	0.00	0	0.00
12.91	0.01951					.013924	0.18			0.970			0.00	
286.47	2521.80	1.093	2522.893	15.0	8.53	1.130	2524.023	0.00	1.396	2.00	0.00	0.00	0	0.00
8.28	0.01951					.012286	0.10			0.970			0.00	
294.75	2521.96	1.136	2523.097	15.0	8.13	1.027	2524.124	0.00	1.396	2.00	0.00	0.00	0	0.00
5.48	0.01951					.010856	0.06			0.970			0.00	

ST-RH036525

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

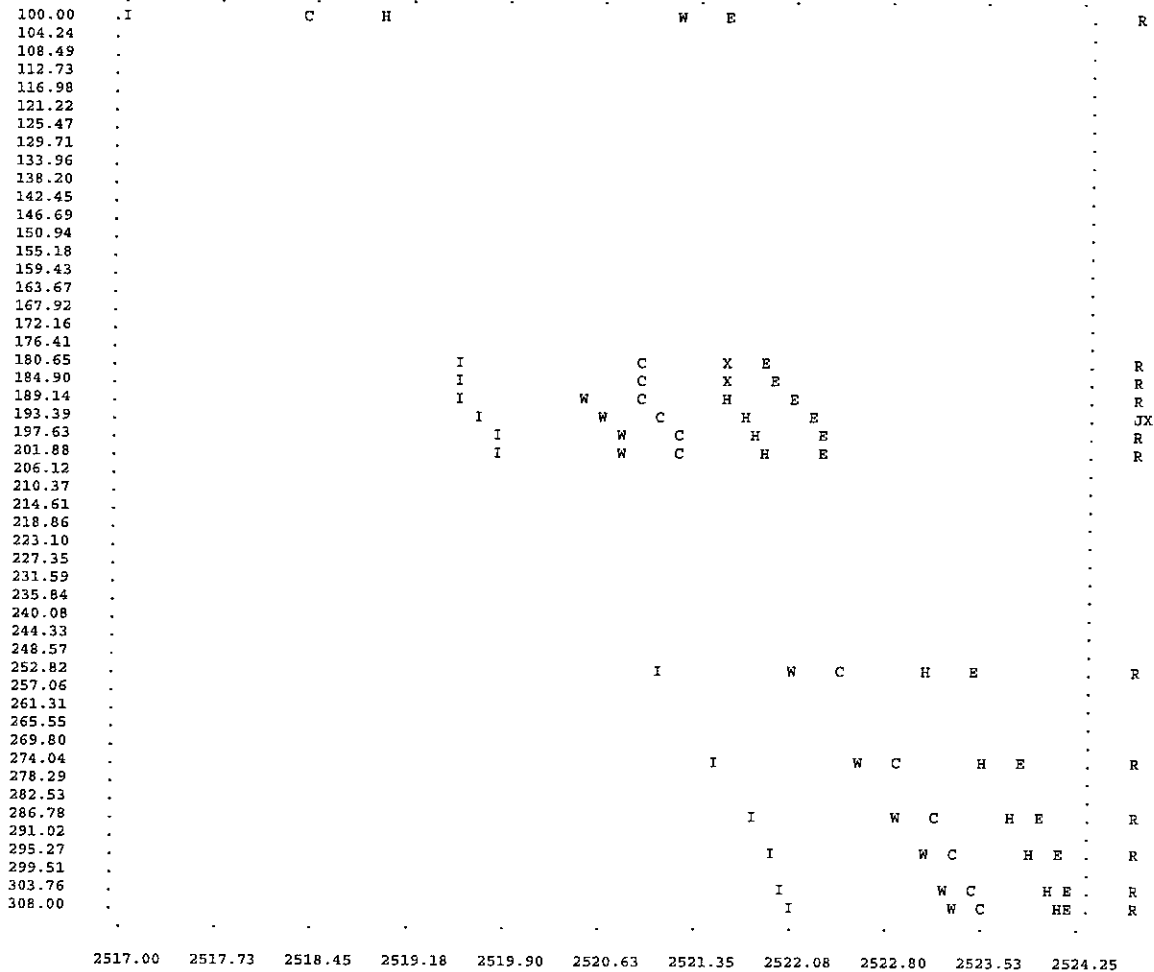
GOLDEN VALLEY

STORM DRAIN IN POD 2 ON D2 STREET FOR 19 CFS J-N30

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
300.23	2522.07	1.182	2523.250	15.0	7.76	0.934	2524.184	0.00	1.396	2.00	0.00	0.00	0	0.00
3.73	0.01951					.009604	0.04			0.970		0.00		
303.96	2522.14	1.230	2523.371	15.0	7.40	0.849	2524.220	0.00	1.396	2.00	0.00	0.00	0	0.00
2.38	0.01951					.008507	0.02			0.970		0.00		
306.34	2522.19	1.281	2523.469	15.0	7.05	0.772	2524.241	0.00	1.396	2.00	0.00	0.00	0	0.00
1.28	0.01951					.007550	0.01			0.970		0.00		
307.62	2522.21	1.336	2523.548	15.0	6.72	0.702	2524.250	0.00	1.396	2.00	0.00	0.00	0	0.00
0.38	0.01951					.006712	0.00			0.970		0.00		
308.00	2522.22	1.396	2523.616	15.0	6.40	0.637	2524.253	0.00	1.396	2.00	0.00	0.00	0	0.00

ST-RH036526

GOLDEN VALLEY RANCH
GOLDEN VALLEY
STORM DRAIN IN POD 2 ON D2 STREET FOR 19 CFS J-N30

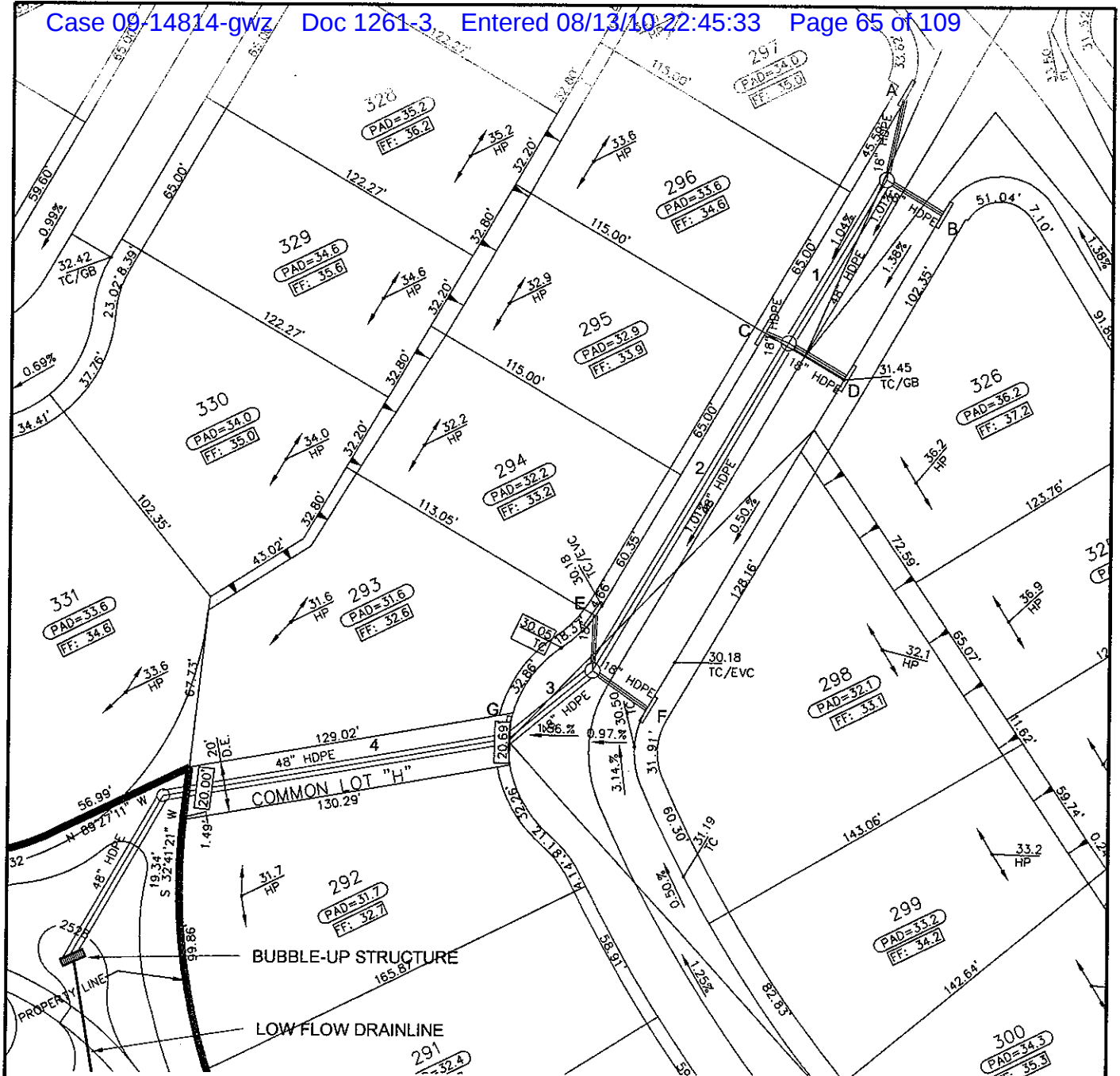


NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY



STORM DRAIN SYSTEM

INLET	SIZE	Q _{inlet}	Q _{intercept}	Q _{bypass}	Grade/Sump
A	8.5	44	11	33	G
B	8.5	45	11	34	G
C	8.5	48	12	36	G
D	11.5	47	15	32	G
E	8.5	34	9	25	G
F	11.5	33	14	19	G
G	14.5	63	15	18	S

SD PIPES

PIPE	Q _{pipe}	Size
1	22	A
2	49	B
3	72	C
4	87	D

BUBBLE-UP STR

PIPE Type	Open Area
48 Type 8	10 X 3.5

REVISIONS	DWN	APVD	APVD	DATE
-----------	-----	------	------	------

DESIGNED RJM
 DRAWN RJM
 CHECKED _____
 APPROVED _____
 APPROVED _____
 DATE 3/02/06

RHODES HOMES ARIZONA
 GOLDEN VALLEY RANCH
 AREA 2 - PHASE A

COMMON LOT H
 NODE J-N15

SCALE 1" = 60'

NO.	REV.
A	0

STANLEY CONSULTANTS
 CADD A1-R3

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjmProject Description
COMMON EASEMENT H
NODE J-N15
INLET A

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0104
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	44.000
T	Width of Spread (ft)	29.44

Gutter Flow

Eo	Gutter Flow Ratio	0.146
d	Depth of Flow (ft)	0.68
V	Average Velocity (ft/sec)	5.03

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	57.06	4.25	0.04	1.883	42.117
Parallel Bar P-1-7/8	1.50	2.88	0.21	9.054	33.062
Combination			0.25	10.938	33.062

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description
COMMON EASEMENT H
NODE J-N15
INLET B

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0104
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	45.000
T	Width of Spread (ft)	29.69

Gutter Flow

Eo	Gutter Flow Ratio	0.145
d	Depth of Flow (ft)	0.69
V	Average Velocity (ft/sec)	5.06

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	57.77	4.25	0.04	1.903	43.097
Parallel Bar P-1-7/8	1.50	2.88	0.21	9.184	33.914
Combination			0.25	11.086	33.914

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description
COMMON EASEMENT H
NODE J-N15
INLET C

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0101
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	48.000
T	Width of Spread (ft)	30.60

Gutter Flow

Eo	Gutter Flow Ratio	0.140
d	Depth of Flow (ft)	0.71
V	Average Velocity (ft/sec)	5.09

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	59.46	4.25	0.04	1.972	46.028
Parallel Bar P-1-7/8	1.50	2.88	0.21	9.584	36.444
Combination			0.24	11.556	36.444

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT H
NODE J-N15
INLET D

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0101
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	47.000
T	Width of Spread (ft)	30.35

Gutter Flow

Eo	Gutter Flow Ratio	0.142
d	Depth of Flow (ft)	0.70
V	Average Velocity (ft/sec)	5.06

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	58.77	5.75	0.04	1.954	45.046
Parallel Bar P-1-7/8	1.50	4.38	0.30	13.416	31.631
Combination			0.33	15.369	31.631

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT H
NODE J-N15
INLET E

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0101
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	34.000
T	Width of Spread (ft)	26.85

Gutter Flow

Eo	Gutter Flow Ratio	0.161
d	Depth of Flow (ft)	0.63
V	Average Velocity (ft/sec)	4.67

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	49.09	4.25	0.05	1.689	32.311
Parallel Bar P-1-7/8	1.50	2.88	0.24	7.698	24.614
Combination			0.28	9.386	24.614

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description
COMMON EASEMENT H
NODE J-N15
INLET F

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0050
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	33.000
T	Width of Spread (ft)	30.33

Gutter Flow

Eo	Gutter Flow Ratio	0.142
d	Depth of Flow (ft)	0.70
V	Average Velocity (ft/sec)	3.56

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	41.02	5.75	0.06	1.957	31.043
Parallel Bar P-1-7/8	1.50	4.38	0.40	12.308	18.734
Combination			0.43	14.266	18.734

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjm

Project Description

SAG INLETS - ALL PODS

MODIFIED "C" L-17.5

NODE J-W IS INLET 6

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	8.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.00
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	7.38
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.521
d_curb	Depth at Curb (ft)	0.667
Qi	Intercepted Flow (cfs)	15.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet

Worksheet for Triangular Channel

Project Description

Worksheet	COMMON LOT H - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.020
Channel Slope	0.010000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	48.00 cfs

Results

Depth	0.68 ft
Flow Area	13.3 ft ²
Wetted Perimeter	39.12 ft
Top Width	39.10 ft
Critical Depth	0.70 ft
Critical Slope	0.008264 ft/ft
Velocity	3.62 ft/s
Velocity Head	0.20 ft
Specific Energy	0.88 ft
Froude Number	1.09
Flow Type	Supercritical

VELOCITY x DEPTH

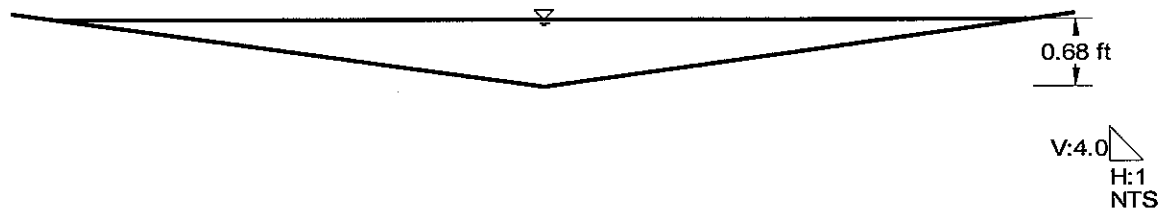
$$3.6 \times 0.7 = 2.5 < 6.0$$

Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	COMMON LOT H - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

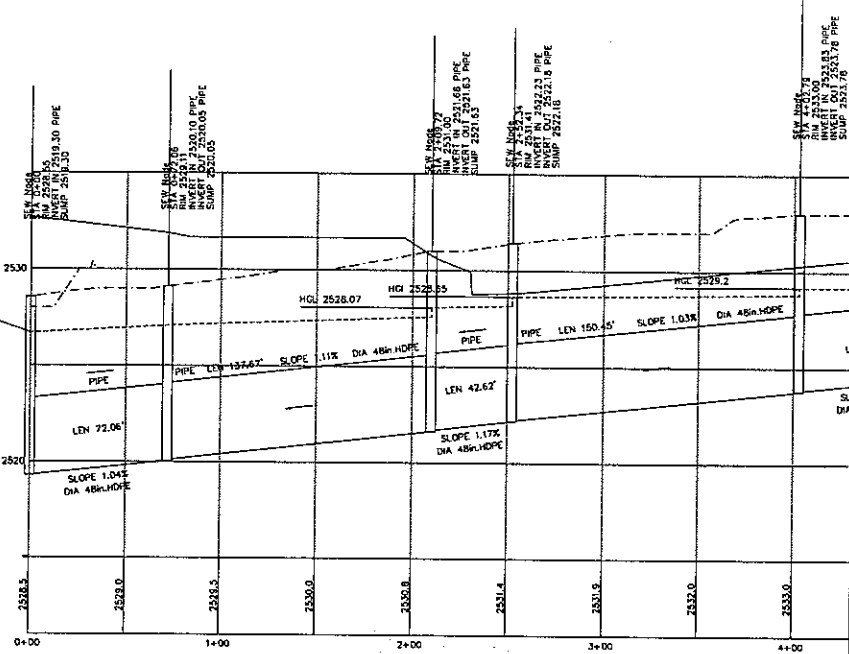
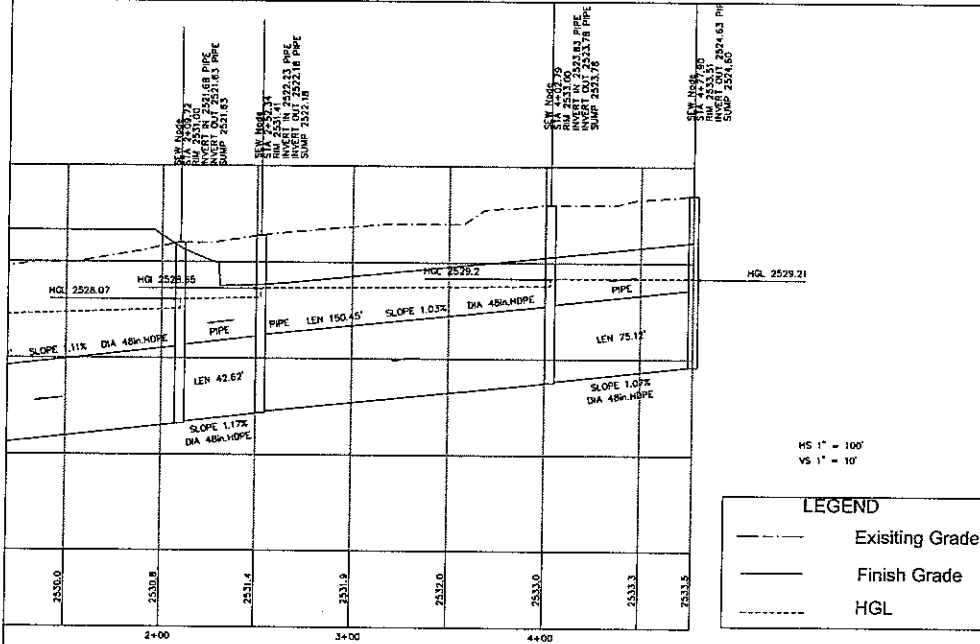
Section Data	
Mannings Coefficient	0.020
Channel Slope	0.010000 ft/ft
Depth	0.68 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	48.00 cfs



Q:\18449\dwg\design\SD_PRO\POD2\G1_G1.dwg, 3/16/2006 5:57:17 PM, \\wg-ps1\hp5100-eng, 1:1

\$\$\$\$\$FILENAME\$\$\$\$\$ STANLEY CONSULTANTS
CADD A1-R3

<table border="1"> <tr> <td>DESIGNED</td> <td>RJM</td> </tr> <tr> <td>DRAWN</td> <td>RN</td> </tr> <tr> <td>CHECKED</td> <td></td> </tr> <tr> <td>APPROVED</td> <td></td> </tr> <tr> <td>APPROVED</td> <td></td> </tr> <tr> <td>DATE</td> <td></td> </tr> </table>					DESIGNED	RJM	DRAWN	RN	CHECKED		APPROVED		APPROVED		DATE		<table border="1"> <tr> <td>REVISIONS</td> <td>DWN</td> <td>APVD</td> <td>APVD</td> <td>DATE</td> </tr> </table>		REVISIONS	DWN	APVD	APVD	DATE	<p>Stanley Consultants INC.</p> <p>RHODES HOMES ARIZONA GOLDEN VALLEY RANCH AREA 2 - PHASE A</p>		<p>COMMON LOT H NODE J-N15</p>		<p>SCALE 1:1</p> <table border="1"> <tr> <td>NO.</td> <td>REV.</td> </tr> <tr> <td>A</td> <td>0</td> </tr> </table>		NO.	REV.	A	0
DESIGNED	RJM																																
DRAWN	RN																																
CHECKED																																	
APPROVED																																	
APPROVED																																	
DATE																																	
REVISIONS	DWN	APVD	APVD	DATE																													
NO.	REV.																																
A	0																																



F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

STORM DRAIN IN POD 2 G2 STREET FOR 103 CFS

ST-RH036539

DATE: 3/15/2006
TIME: 14:35

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	48	4			4.00														
CD	60	4			5.00														
CD	54	4			4.50														
CD	36	4			3.00														
CD	66	3	0	0.00	4.00	6.00	0.00	0.00	0.00										
CD	30	4			2.50														
CD	18	4			1.50														
CD	42	4			3.50														

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV								
			100.00	2519.70	48	2526.70								
ELEMENT NO	2 IS A REACH	U/S DATA	STATION	INVERT	SECT									
			170.00	2520.40	48		N			RADIUS	ANGLE	ANG PT	MAN H	
							0.013			0.00	0.00	50.00	0	
ELEMENT NO	3 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			175.00	2520.45	48	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00
ELEMENT NO	4 IS A REACH	U/S DATA	STATION	INVERT	SECT			N						
			308.00	2521.88	48			0.013			RADIUS	ANGLE	ANG PT	MAN H
											0.00	0.00	0.00	0
ELEMENT NO	5 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			313.00	2521.93	48	18	0	0.013	15.0	0.0	2521.93	0.00	90.00	0.00
ELEMENT NO	6 IS A REACH	U/S DATA	STATION	INVERT	SECT			N						
			353.00	2522.33	48			0.013			RADIUS	ANGLE	ANG PT	MAN H
											0.00	0.00	0.00	0
ELEMENT NO	7 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			358.00	2522.38	48	18	18	0.013	9.0	14.0	2522.38	2522.38	45.00	90.00
ELEMENT NO	8 IS A REACH	U/S DATA	STATION	INVERT	SECT			N						
			503.00	2523.83	48			0.013			RADIUS	ANGLE	ANG PT	MAN H
											0.00	0.00	0.00	0
ELEMENT NO	9 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			508.00	2523.88	48	18	18	0.013	12.0	15.0	2523.88	2523.88	90.00	90.00

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	10 IS A REACH	*	*	*						
	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H	
		583.00	2524.63	48	0.013	0.00	0.00	0.00	0	

ELEMENT NO	11 IS A SYSTEM HEADWORKS	*	*							
	U/S DATA	STATION	INVERT	SECT		W S ELEV				
		583.00	2524.63	48		0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

STORM DRAIN IN POD 2 G2 STREET FOR 103 CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
100.00	2519.70	7.000	2526.700	87.0	6.92	0.744	2527.444	0.00	2.828	4.00	0.00	0.00	0	0.00
70.00	0.01000					.003668	0.26		2.246			0.00		
170.00	2520.40	6.680	2527.080	87.0	6.92	0.744	2527.824	0.00	2.828	4.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.003668	0.02					0.00		
175.00	2520.45	6.648	2527.098	87.0	6.92	0.744	2527.842	0.00	2.828	4.00	0.00	0.00	0	0.00
133.00	0.01075					.003668	0.49		2.196			0.00		
308.00	2521.88	5.706	2527.586	87.0	6.92	0.744	2528.330	0.00	2.828	4.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.003090	0.02					0.00		
313.00	2521.93	6.140	2528.070	72.0	5.73	0.510	2528.580	0.00	2.566	4.00	0.00	0.00	0	0.00
40.00	0.01000					.002512	0.10		2.002			0.00		
353.00	2522.33	5.841	2528.171	72.0	5.73	0.510	2528.681	0.00	2.566	4.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.001838	0.01					0.00		
358.00	2522.38	6.267	2528.647	49.0	3.90	0.236	2528.883	0.00	2.099	4.00	0.00	0.00	0	0.00
145.00	0.01000					.001164	0.17		1.610			0.00		
503.00	2523.83	4.986	2528.816	49.0	3.90	0.236	2529.052	0.00	2.099	4.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.000700	0.00					0.00		
508.00	2523.88	5.316	2529.196	22.0	1.75	0.048	2529.244	0.00	1.383	4.00	0.00	0.00	0	0.00
75.00	0.01000					.000235	0.02		1.057			0.00		
583.00	2524.63	4.584	2529.214	22.0	1.75	0.048	2529.262	0.00	1.383	4.00	0.00	0.00	0	0.00

ST-RH036543

GOLDEN VALLEY RANCH
GOLDEN VALLEY
STORM DRAIN IN POD 2 G2 STREET FOR 103 CFS

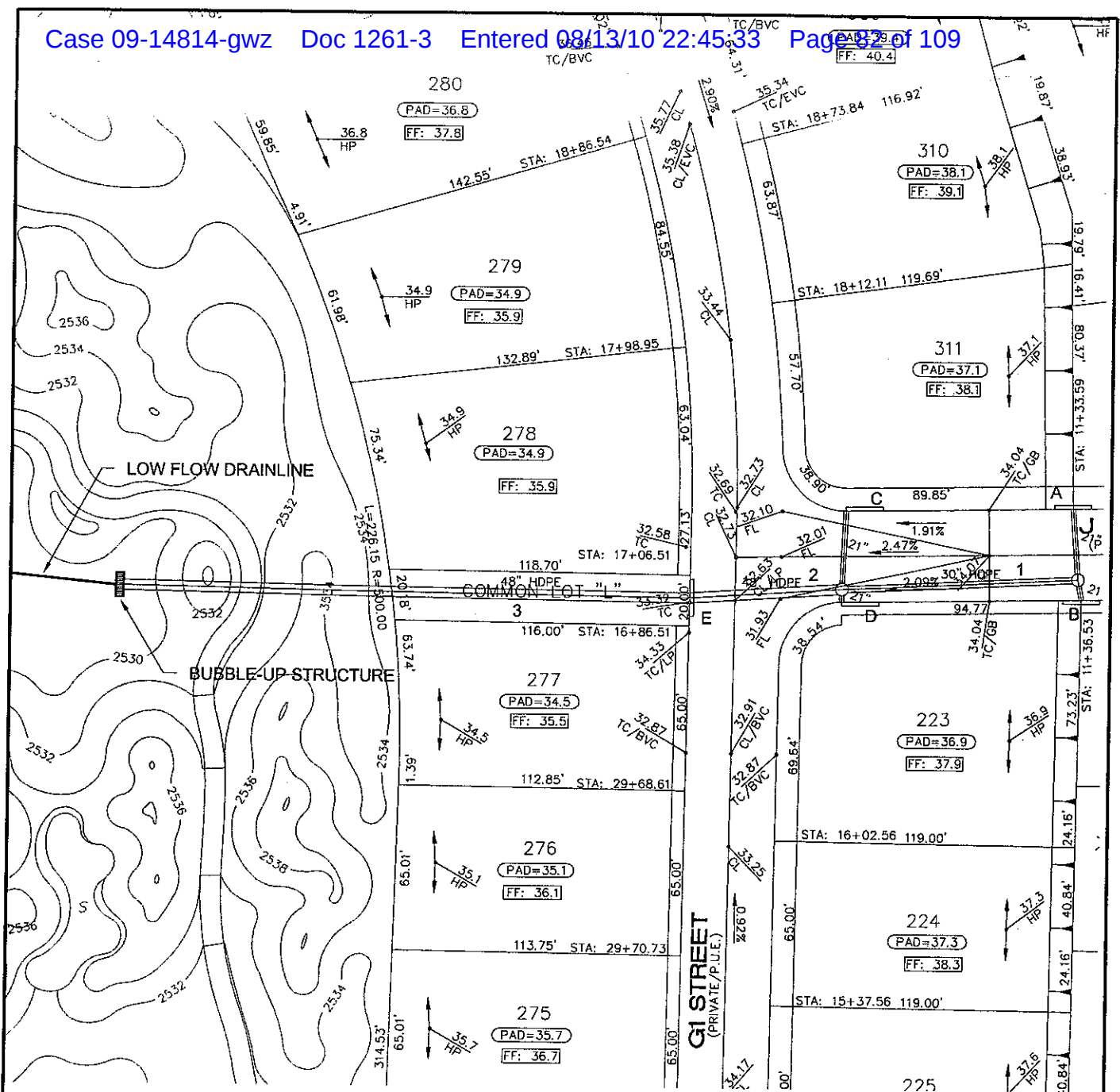
100.00	I			C		H				W		E					R
109.86																	
119.71																	
129.57																	
139.43																	
149.29																	
159.14																	
169.00																	
178.86		I			C		H			W		E					JX
188.71		I			C		H			W		E					R
198.57																	
208.43																	
218.29																	
228.14																	
238.00																	
247.86																	
257.71																	
267.57																	
277.43																	
287.29																	
297.14																	
307.00																	
316.86			I			C		H		W		E					JX
326.71			I			C		H			W	E					R
336.57																	
346.43																	
356.29			I			C		H			W	E					JX
366.14			I			C		H				W	E				R
376.00																	
385.86																	
395.71																	
405.57																	
415.43																	
425.29																	
435.14																	
445.00																	
454.86																	
464.71																	
474.57																	
484.43																	
494.29																	
504.14						I		C			H		W	E			JX
514.00						I		C			H			X			R
523.86																	
533.71																	
543.57																	
553.43																	
563.29																	
573.14																	
583.00							I	C				H		X			R
	2519.70	2520.66	2521.61	2522.57	2523.53	2524.48	2525.44	2526.39	2527.35	2528.31	2529.26						

NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY



STORM DRAIN SYSTEM					
INLET	SIZE	Q _{inlet}	Q _{intercept}	Q _{bypass}	Grade/Sump
A	14.5	54	18	36	G
B	14.5	54	18	36	G
C	14.5	36	14	22	G
D	8.5	36	14	22	G
E	11.5	72	12	60	S

SD PIPES		
PIPE	Q _{pipe}	Size
1	36	A
2	64	B
3	76	C

BUBBLE-UP STR		
PIPE	Type	Open Area
48	Type 8	10 X 3.5

REVISIONS	DWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RJM				
CHECKED				
APPROVED				
APPROVED				
DATE 3/02/06				


Stanley Consultants INC.

RHODES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 2 - PHASE B

COMMON LOT L
NODE J-S20

SCALE 1" = 60'
NO. A
REV. 0

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT L
NODE J-S20
INLET A

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0247
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	54.000
T	Width of Spread (ft)	27.01

Gutter Flow

Eo	Gutter Flow Ratio	0.160
d	Depth of Flow (ft)	0.64
V	Average Velocity (ft/sec)	7.33

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	78.13	7.25	0.03	1.692	52.308
Parallel Bar P-1-7/8	1.50	5.88	0.31	16.398	35.910
Combination			0.33	18.090	35.910

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjmProject Description
COMMON EASEMENT L
NODE J-S20
INLET B

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0247
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	54.000
T	Width of Spread (ft)	27.01

Gutter Flow

Eo	Gutter Flow Ratio	0.160
d	Depth of Flow (ft)	0.64
V	Average Velocity (ft/sec)	7.33

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	78.13	7.25	0.03	1.692	52.308
Parallel Bar P-1-7/8	1.50	5.88	0.31	16.398	35.910
Combination			0.33	18.090	35.910

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT L
NODE J-S20
INLET C

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0197
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	34.000
T	Width of Spread (ft)	23.56

Gutter Flow

Eo	Gutter Flow Ratio	0.185
d	Depth of Flow (ft)	0.57
V	Average Velocity (ft/sec)	6.05

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	57.08	7.25	0.04	1.455	32.545
Parallel Bar P-1-7/8	1.50	5.88	0.38	12.427	20.118
Combination			0.41	13.882	20.118

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 2
Project Name.:Golden Valley Ranch
Computed by :rjmProject Description
COMMON EASEMENT L
NODE J-S20
INLET D

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0209
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	34.000
T	Width of Spread (ft)	23.30

Gutter Flow

Eo	Gutter Flow Ratio	0.187
d	Depth of Flow (ft)	0.56
V	Average Velocity (ft/sec)	6.18

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	57.84	7.25	0.04	1.436	32.564
Parallel Bar P-1-7/8	1.50	5.88	0.38	12.297	20.267
Combination			0.40	13.733	20.267

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjmProject Description
SAG INLETS - ALL PODS
MODIFIED "C" L-14.5
15006 J-520 15067 E

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	5.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.39
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	5.88
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.525
d_curb	Depth at Curb (ft)	0.671
Qi	Intercepted Flow (cfs)	12.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet for Triangular Channel

Project Description	
Worksheet	COMMON LOT L - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	60.00 cfs

Results	
Depth	0.84 ft
Flow Area	20.4 ft ²
Wetted Perimeter	48.46 ft
Top Width	48.43 ft
Critical Depth	0.77 ft
Critical Slope	0.008018 ft/ft
Velocity	2.95 ft/s
Velocity Head	0.13 ft
Specific Energy	0.98 ft
Froude Number	0.80
Flow Type	Subcritical

VELOCITY x DEPTH

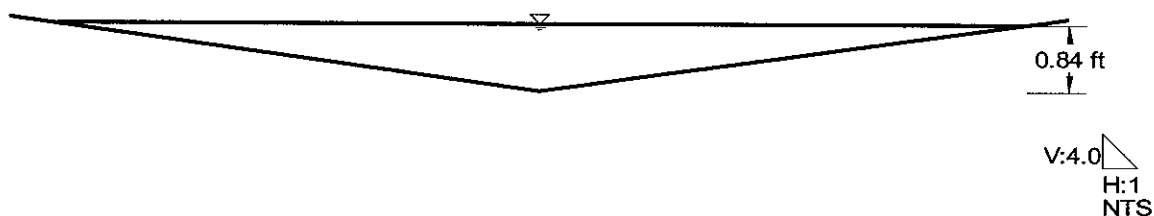
$$3.0 \times 0.8 = 2.4 < 6.0$$

Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	COMMON LOT L - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

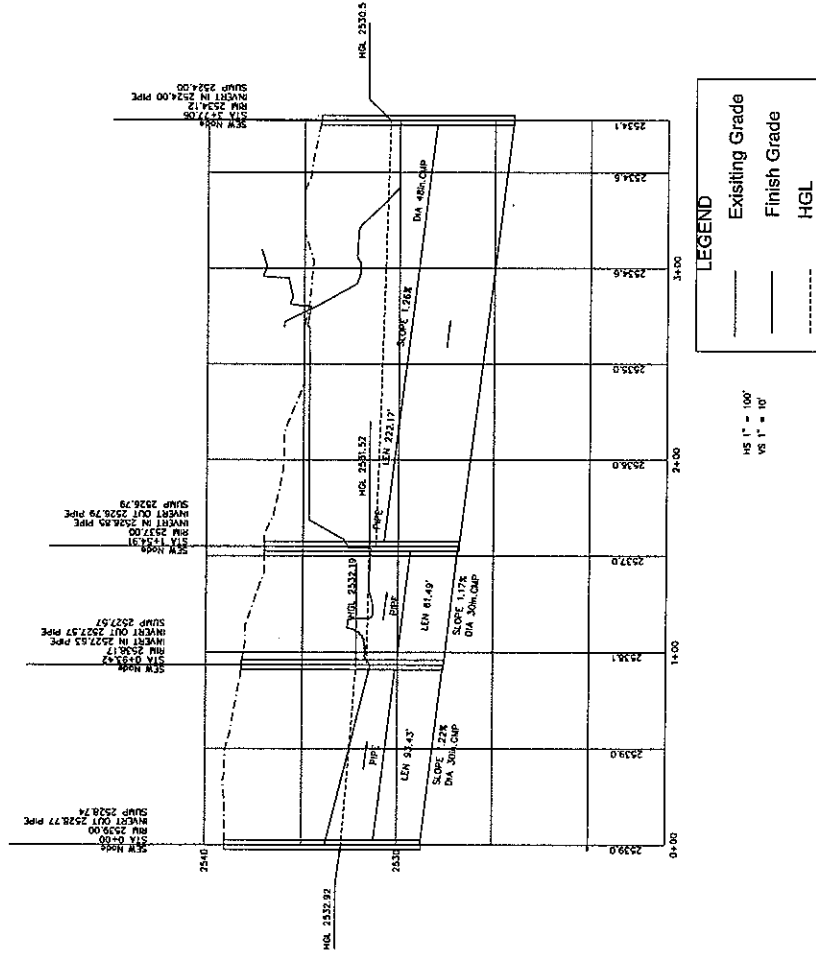
Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.84 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	60.00 cfs




Q:\18449\dwg\design\SD_PRO\POD2\POD2_Jstr_G1str.dwg, 3/22/2006 1:17:45 PM, \\wg-ps1\hp5100-eng, 1:1

\$\$\$\$\$FILENAME\$\$\$\$\$

CADD A1-R3 © STANLEY CONSULTANTS



 Stanley Consultants INC.					SCALE 1:1 NO. A REV. 0	
REVISIONS DESIGNED RJM DRAWN RN CHECKED APPROVED APPROVED DATE DATE					RHODES HOMES ARIZONA GOLDEN VALLEY RANCH PROJECT_LOCATION	
COMMON LOT L NODE J-S20						

ST-RH036553

P 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

LATERAL WITH FLOW 36CFS JS20 AT POD2 J - G1 STR

ST-RH036554

DATE: 3/15/2006
TIME: 14:49

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	48	4			4.00														
CD	30	4			2.50														
CD	18	4			1.50														
CD	21	4			1.75														

ST-RH036555

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	DESCRIPTION	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A SYSTEM OUTLET	100.00	2524.00	48	2530.50				
2	IS A REACH	345.00	2526.79	48		0.00	0.00	0.00	0
3	IS A JUNCTION	345.00	2526.85	48					
4	IS A REACH	405.00	2527.57	48		0.00	0.00	0.00	0
5	IS A JUNCTION	405.00	2527.63	48					
6	IS A REACH	500.00	2528.77	30		0.00	0.00	0.00	0
7	IS A SYSTEM HEADWORKS	500.00	2528.77	30					

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P
WATER SURFACE PROFILE LISTING

PAGE 1

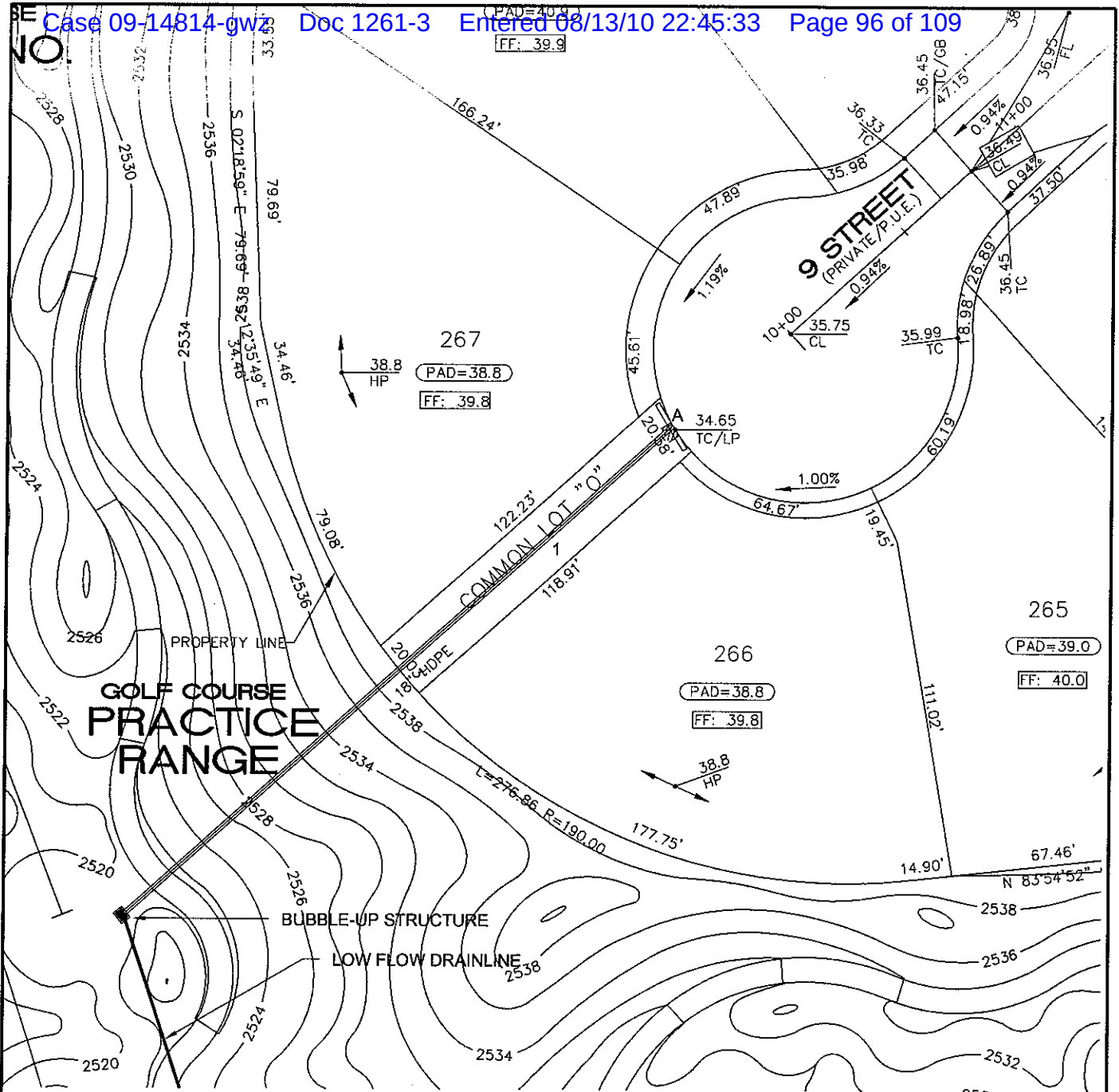
GOLDEN VALLEY RANCH
GOLDEN VALLEY
LATERAL WITH FLOW 35CFS J-C21

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SP AVE	HF		NORM DEPTH			ZR		
100.00	2524.00	6.500	2530.500	76.0	6.05	0.568	2531.068	0.00	2.639	4.00	0.00	0.00	0	0.00
245.00	0.01139					.002799	0.69		1.990			0.00		
345.00	2526.79	4.396	2531.186	76.0	6.05	0.568	2531.754	0.00	2.639	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002392	0.00					0.00		
345.00	2526.85	4.666	2531.516	64.0	5.09	0.403	2531.919	0.00	2.414	4.00	0.00	0.00	0	0.00
60.00	0.01200					.001985	0.12		1.775			0.00		
405.00	2527.57	4.065	2531.635	64.0	5.09	0.403	2532.038	0.00	2.414	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001306	0.00					0.00		
405.00	2527.63	4.556	2532.186	36.0	7.33	0.835	2533.021	0.00	2.035	2.50	0.00	0.00	0	0.00
95.00	0.01200					.007703	0.73		1.692			0.00		
500.00	2528.77	4.148	2532.918	36.0	7.33	0.835	2533.753	0.00	2.035	2.50	0.00	0.00	0	0.00

ST-RH036557

Wavelength (Å)	Intensity	Ionization	Electron	Proton	Neutron	Photon	Other
100.00	.	I					R
108.16	.		C	H		W	E
116.33	.						
124.49	.						
132.65	.						
140.82	.						
148.98	.						
157.14	.						
165.31	.						
173.47	.						
181.63	.						
189.80	.						
197.96	.						
206.12	.						
214.29	.						
222.45	.						
230.61	.						
238.78	.						
246.94	.						
255.10	.						
263.27	.						
271.43	.						
279.59	.						
287.76	.						
295.92	.						
304.08	.						
312.24	.						
320.41	.						
328.57	.						
336.73	.						
344.90	.						
353.06	.		I		C	H	W
361.22	.		I		C	H	W
369.39	.						E
377.55	.						
385.71	.						
393.88	.						
402.04	.						
410.20	.			I		C	H
418.37	.			I		C	H
426.53	.						
434.69	.						
442.86	.						
451.02	.						
459.18	.						
467.35	.						
475.51	.						
483.67	.						
491.84	.						
500.00	.				I	C	H
	.						W
	.						E
	.						R

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY



STORM DRAIN SYSTEM						SD PIPES			BUBBLE-UP STR	
INLET	SIZE	Q _{inlet}	Q _{intercept}	Q _{bypass}	Grade/Sump	PIPE	Q _{pipe}	Size	PIPE Type	Open Area
A	17.5	51	15	36	S	1	15	A	18 Type F	2.5 x 3.5

REVISIONS	DWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RJM				
CHECKED				
APPROVED				
APPROVED				
DATE 3/02/06				

Stanley Consultants INC.

RHODES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 2 - PHASE B

COMMON LOT O
SHED P2-67

SCALE 1" = 50'
NO. A
REV. 0

STANLEY CONSULTANTS
CADD A1-R3

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjm

Project Description
 SAG INLETS - ALL PODS
 MODIFIED "C" L-17.5
 SHED P2-67 INLET A *Common Lot "O"*
 Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	8.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.00
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	7.38
	Inlet Type *Sag*	Sweeper Combination
d _{ave}	Depth of Flow (ft)	0.521
d _{curb}	Depth at Curb (ft)	0.667
Qi	Intercepted Flow (cfs)	15.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet

Worksheet for Triangular Channel

Project Description	
Worksheet	COMMON LOT 0 - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	36.00 cfs

Results	
Depth	0.69 ft
Flow Area	13.9 ft ²
Wetted Perimeter	40.01 ft
Top Width	39.99 ft
Critical Depth	0.63 ft
Critical Slope	0.008577 ft/ft
Velocity	2.59 ft/s
Velocity Head	0.10 ft
Specific Energy	0.80 ft
Froude Number	0.78
Flow Type	Subcritical

VELOCITY x DEPTH

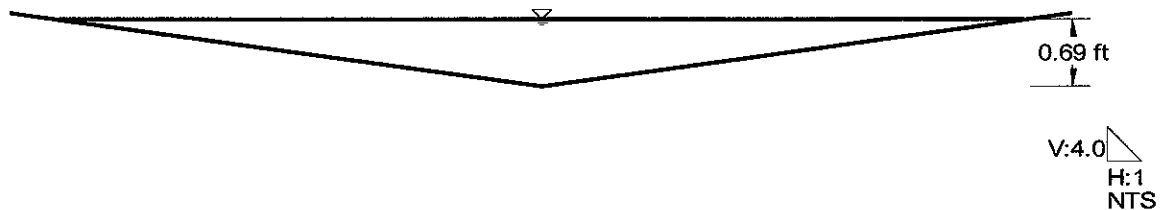
$$2.6 \times 0.7 = 1.8 < 6.0$$

Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	COMMON LOT 0 - Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

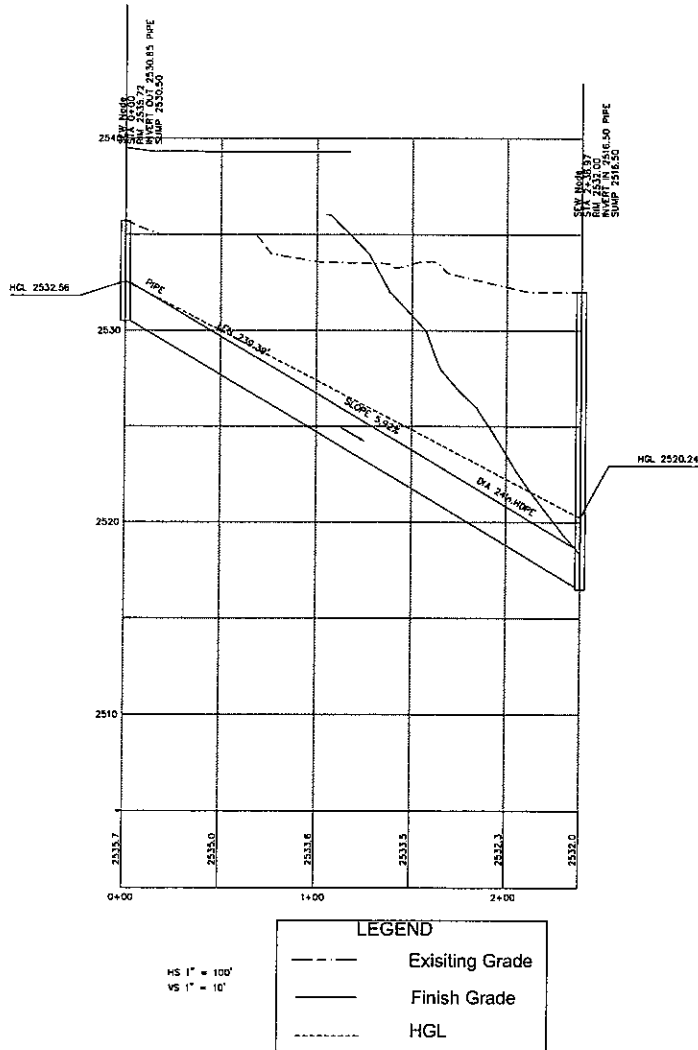
Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.69 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	36.00 cfs




Q:\18449\dwg\design\SD_PRO\POD2\POD2_9str_CulDesac.dwg, 3/16/2006 5:54:04 PM, \\lvg-ps1\hp5100-eng, 1:1

\$\$\$\$\$FILENAME\$\$\$\$\$

CADD A1-R3 © STANLEY CONSULTANTS



<div style="text-align: center;">  Stanley Consultants INC. </div>					SCALE NO. A REV. 0	
REVISIONS DESIGNED <u>RJM</u> DRAWN <u>RN</u> CHECKED _____ APPROVED _____ APPROVED _____ DATE <u>DATE</u>	DWN _____	APVD _____	APVD _____	DATE _____	RHODES HOMES ARIZONA GOLDEN VALLEY RANCH AREA 2 - PHASE B	COMMON LOT 0 SHED P2-67

P 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

LATERAL IN POD 2 P2-67 FLOW - 32CFS 9 STR AND G1 STR

ST-RH036564

DATE: 3/10/2006
TIME: 10: 5

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			2.00														

ST-RH036565

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	DESCRIPTION	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG FT	MAN H	W S ELEV
1	IS A SYSTEM OUTLET										
		100.00	2516.50	18							2521.00
2	IS A REACH										
		350.00	2530.65	18		0.013	0.00	0.00	0.00	0	
3	IS A SYSTEM HEADWORKS										
		350.00	2530.65	18							0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

LATERAL IN POD 2 P2-67 FLOW - 32CFS 9 STR AND G1 STR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
100.00	2516.50	4.500	2521.000	48.0	15.28	3.624	2524.624	0.00	1.977	2.00	0.00	0.00	0	0.00
114.81	0.05660					.045020	5.17			1.470		0.00		
214.81	2523.00	3.175	2526.173	48.0	15.28	3.624	2529.797	0.00	1.977	2.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00	
214.81	2523.00	1.525	2524.523	48.0	18.68	5.417	2529.940	0.00	1.977	2.00	0.00	0.00	0	0.00
23.89	0.05660					.051681	1.23			1.470		0.00		
238.70	2524.35	1.536	2525.886	48.0	18.53	5.329	2531.215	0.00	1.977	2.00	0.00	0.00	0	0.00
51.86	0.05660					.048759	2.53			1.470		0.00		
290.56	2527.29	1.614	2528.900	48.0	17.67	4.846	2533.746	0.00	1.977	2.00	0.00	0.00	0	0.00
28.67	0.05660					.044302	1.27			1.470		0.00		
319.23	2528.91	1.702	2530.610	48.0	16.84	4.405	2535.015	0.00	1.977	2.00	0.00	0.00	0	0.00
18.72	0.05660					.040872	0.77			1.470		0.00		
337.95	2529.97	1.808	2531.776	48.0	16.06	4.004	2535.780	0.00	1.977	2.00	0.00	0.00	0	0.00
12.05	0.05660					.040349	0.49			1.470		0.00		
350.00	2530.65	1.977	2532.627	48.0	15.31	3.640	2536.267	0.00	1.977	2.00	0.00	0.00	0	0.00

ST-RH036567

GOLDEN VALLEY RANCH

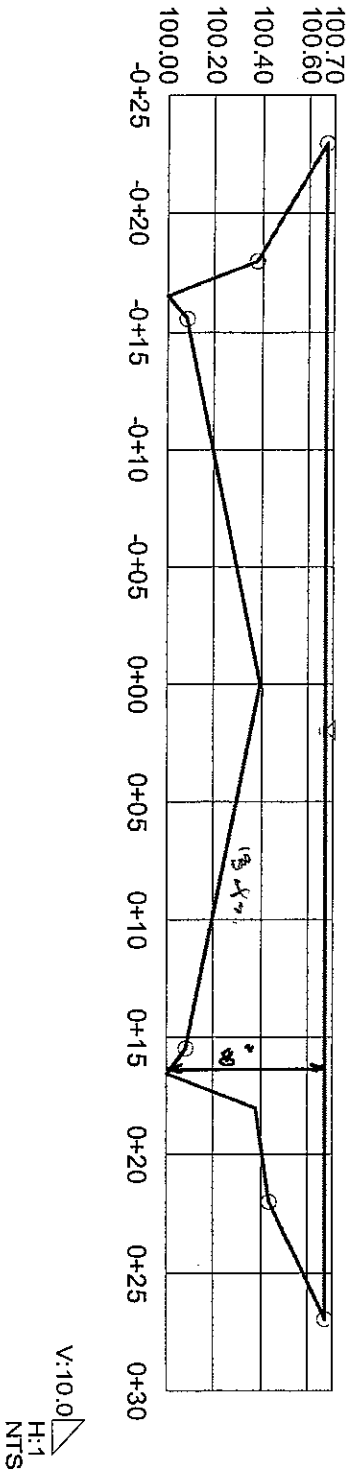
APPENDIX C

STREET CAPACITY (LOCAL STREETS)

Cross Section Cross Section for Irregular Channel

Project Description	
Worksheet	Local Str 50' Pl
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.005000 ft/ft
Water Surface Elev.	100.67 ft
Elevation Range	1.00 to 100.67
Discharge	68.88 cfs



q:\18449\drainage calcs\street flow.fm2
12/30/05 11:35:56 AM

Stanley Consultants, Inc
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Information Services
FlowMaster v7.0 [7.0005]
Page 1 of 1

ST-RH036570

Table

Rating Table for Irregular Channel

Project Description	
Worksheet	Local Str 50' PL
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data
Water Surface Elev. 00.67 ft

Options
Current Roughness Method: Modified Lotter's Method
Open Channel Weighting Method: Modified Lotter's Method
Closed Channel Weighting Method: Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.005000	0.020000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	68.88	3.73	18.5	50.12	50.00
0.005100	69.57	3.76	18.5	50.12	50.00
0.005200	70.25	3.80	18.5	50.12	50.00
0.005300	70.92	3.84	18.5	50.12	50.00
0.005400	71.59	3.87	18.5	50.12	50.00
0.005500	72.25	3.91	18.5	50.12	50.00
0.005600	72.90	3.94	18.5	50.12	50.00
0.005700	73.55	3.98	18.5	50.12	50.00
0.005800	74.19	4.01	18.5	50.12	50.00
0.005900	74.83	4.05	18.5	50.12	50.00
0.006000	75.46	4.08	18.5	50.12	50.00
0.006100	76.09	4.12	18.5	50.12	50.00
0.006200	76.71	4.15	18.5	50.12	50.00
0.006300	77.32	4.18	18.5	50.12	50.00
0.006400	77.93	4.22	18.5	50.12	50.00
0.006500	78.54	4.25	18.5	50.12	50.00
0.006600	79.14	4.28	18.5	50.12	50.00
0.006700	79.74	4.31	18.5	50.12	50.00
0.006800	80.33	4.35	18.5	50.12	50.00
0.006900	80.92	4.38	18.5	50.12	50.00
0.007000	81.51	4.41	18.5	50.12	50.00
0.007100	82.09	4.44	18.5	50.12	50.00
0.007200	82.66	4.47	18.5	50.12	50.00
0.007300	83.23	4.50	18.5	50.12	50.00
0.007400	83.80	4.53	18.5	50.12	50.00
0.007500	84.37	4.56	18.5	50.12	50.00
0.007600	84.93	4.60	18.5	50.12	50.00
0.007700	85.48	4.63	18.5	50.12	50.00
0.007800	86.04	4.66	18.5	50.12	50.00
0.007900	86.59	4.69	18.5	50.12	50.00
0.008000	87.13	4.71	18.5	50.12	50.00
0.008100	87.68	4.74	18.5	50.12	50.00
0.008200	88.22	4.77	18.5	50.12	50.00
0.008300	88.75	4.80	18.5	50.12	50.00

Project Engineer: Information Services

FlowMaster v7.0 [7.0005]

q:\18449\drainage calcs\street flow.fm2

Stanley Consultants, Inc

12/30/05 11:35:00 AM © Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Page 1 of 4

ST-RH036571

Table

Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.008400	89.28	4.83	18.5	50.12	50.00
0.008500	89.81	4.86	18.5	50.12	50.00
0.008600	90.34	4.89	18.5	50.12	50.00
0.008700	90.87	4.92	18.5	50.12	50.00
0.008800	91.39	4.94	18.5	50.12	50.00
0.008900	91.90	4.97	18.5	50.12	50.00
0.009000	92.42	5.00	18.5	50.12	50.00
0.009100	92.93	5.03	18.5	50.12	50.00
0.009200	93.44	5.06	18.5	50.12	50.00
0.009300	93.95	5.08	18.5	50.12	50.00
0.009400	94.45	5.11	18.5	50.12	50.00
0.009500	94.95	5.14	18.5	50.12	50.00
0.009600	95.45	5.16	18.5	50.12	50.00
0.009700	95.95	5.19	18.5	50.12	50.00
0.009800	96.44	5.22	18.5	50.12	50.00
0.009900	96.93	5.24	18.5	50.12	50.00
0.010000	97.42	5.27	18.5	50.12	50.00
0.010100	97.90	5.30	18.5	50.12	50.00
0.010200	98.39	5.32	18.5	50.12	50.00
0.010300	98.87	5.35	18.5	50.12	50.00
0.010400	99.35	5.38	18.5	50.12	50.00
0.010500	99.82	5.40	18.5	50.12	50.00
0.010600	100.30	5.43	18.5	50.12	50.00
0.010700	100.77	5.45	18.5	50.12	50.00
0.010800	101.24	5.48	18.5	50.12	50.00
0.010900	101.71	5.50	18.5	50.12	50.00
0.011000	102.17	5.53	18.5	50.12	50.00
0.011100	102.64	5.55	18.5	50.12	50.00
0.011200	103.10	5.58	18.5	50.12	50.00
0.011300	103.56	5.60	18.5	50.12	50.00
0.011400	104.01	5.63	18.5	50.12	50.00
0.011500	104.47	5.65	18.5	50.12	50.00
0.011600	104.92	5.68	18.5	50.12	50.00
0.011700	105.37	5.70	18.5	50.12	50.00
0.011800	105.82	5.73	18.5	50.12	50.00
0.011900	106.27	5.75	18.5	50.12	50.00
0.012000	106.72	5.77	18.5	50.12	50.00
0.012100	107.16	5.80	18.5	50.12	50.00
0.012200	107.60	5.82	18.5	50.12	50.00
0.012300	108.04	5.85	18.5	50.12	50.00
0.012400	108.48	5.87	18.5	50.12	50.00
0.012500	108.92	5.89	18.5	50.12	50.00
0.012600	109.35	5.92	18.5	50.12	50.00
0.012700	109.78	5.94	18.5	50.12	50.00
0.012800	110.22	5.96	18.5	50.12	50.00
0.012900	110.65	5.99	18.5	50.12	50.00
0.013000	111.07	6.01	18.5	50.12	50.00
0.013100	111.50	6.03	18.5	50.12	50.00
0.013200	111.92	6.06	18.5	50.12	50.00
0.013300	112.35	6.08	18.5	50.12	50.00
0.013400	112.77	6.10	18.5	50.12	50.00
0.013500	113.19	6.12	18.5	50.12	50.00
0.013600	113.61	6.15	18.5	50.12	50.00